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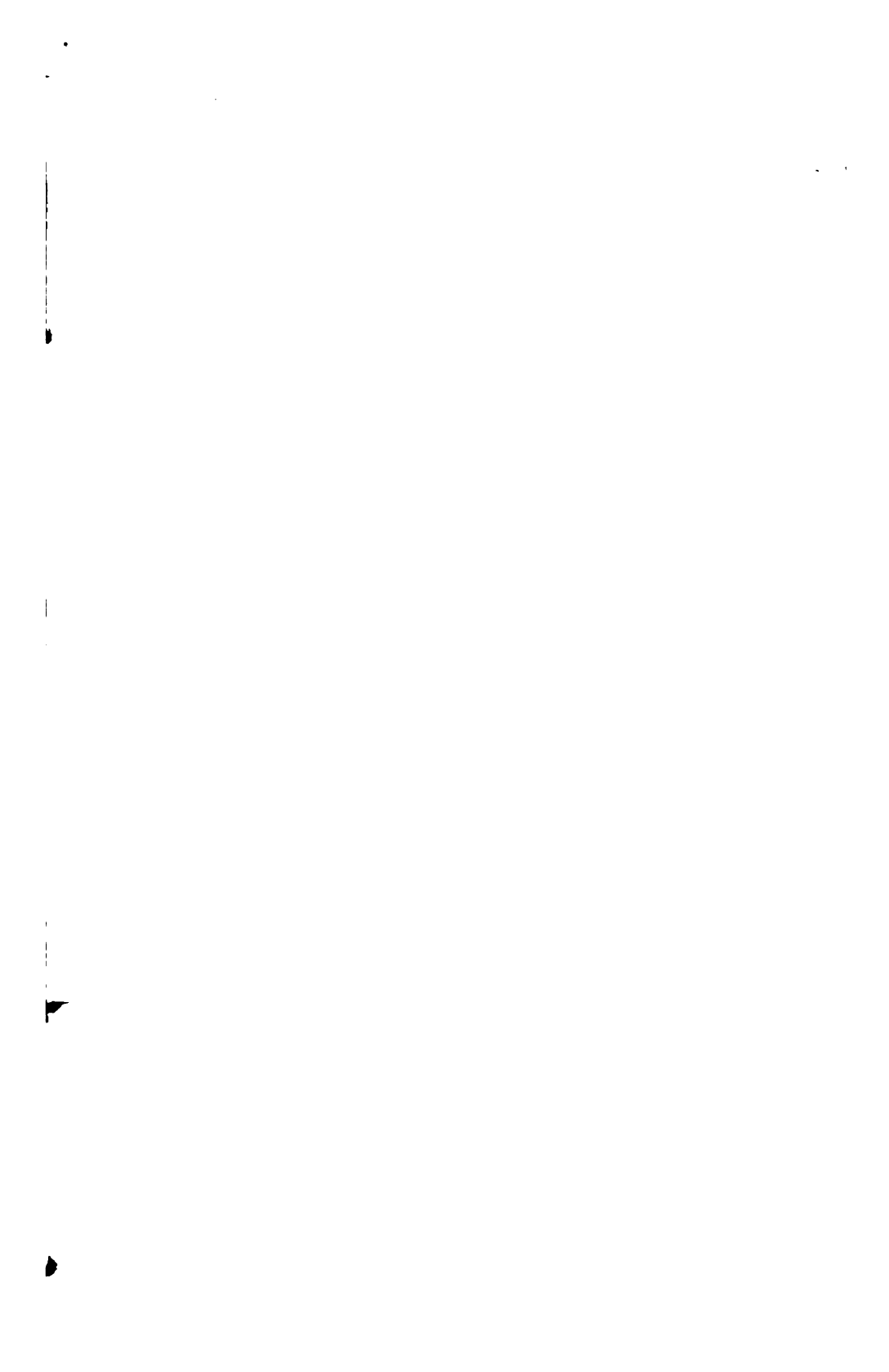
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Anal.



ANNUAL REPORT

OF THE

BOARD OF REGENTS

OF THE

SMITHSONIAN INSTITUTION,

SHOWING

THE OPERATIONS, EXPENDITURES, AND CONDITION

OF THE INSTITUTION

FOR THE

YEAR ENDING JUNE 30, 1898.

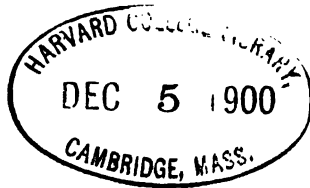
REPORT

OF THE

U. S. NATIONAL MUSEUM.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1900.

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Smithsonian Inst.

AN ACT PROVIDING FOR THE PUBLIC PRINTING AND BINDING, AND THE
DISTRIBUTION OF PUBLIC DOCUMENTS.

Approved January 12, 1895.

"Of the Report of the Smithsonian Institution, ten thousand copies; one thousand copies for the Senate, two thousand for the House, five thousand for distribution by the Smithsonian Institution, and two thousand for distribution by the National Museum."

REPORT
OF THE
U. S. NATIONAL MUSEUM,
UNDER THE DIRECTION OF
THE SMITHSONIAN INSTITUTION,
FOR THE
YEAR ENDING JUNE 30, 1898.

**REPORT OF THE U. S. NATIONAL MUSEUM FOR THE YEAR
ENDING JUNE 30, 1898.**

SUBJECTS.

I. Report of the Acting Assistant Secretary of the Smithsonian Institution, in charge of the National Museum, with Appendices.

II. The Crocodilians, Lizards, and Snakes of North America. By Edward Drinker Cope.

UNITED STATES NATIONAL MUSEUM,
UNDER DIRECTION OF THE SMITHSONIAN INSTITUTION,

Washington, July 1, 1898.

SIR: I have the honor to submit herewith a report upon the present condition of the United States National Museum, and upon the work accomplished in its various departments during the fiscal year ending June 30, 1898.

Very respectfully,

CHARLES D. WALCOTT,

Acting Assistant Secretary, in charge of U. S. National Museum.

Mr. S. P. LANGLEY,

Secretary Smithsonian Institution.

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PART I.

REPORT

UPON THE

CONDITION AND PROGRESS OF THE U. S. NATIONAL MUSEUM
DURING THE YEAR ENDING JUNE 30, 1898.

BY

CHARLES D. WALCOTT,

ACTING ASSISTANT SECRETARY OF THE SMITHSONIAN INSTITUTION,
IN CHARGE OF THE U. S. NATIONAL MUSEUM.

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GENERAL CONSIDERATIONS.

ORGANIZATION.¹

In the introduction to the Report for the fiscal year ending June 30, 1897, attention was called to a new plan of organization, which went into effect July 1, 1897, and the statement was made that the results of its operations would be considered in the Report for 1898.

The various divisions and sections of Anthropology, Biology, and Geology, which had previously been conducted independently of one another, the curators and custodians reporting directly to the Assistant Secretary in charge of the Museum, were united under three head curators, one of anthropology, another of biology, and a third of geology. This secured direct expert supervision and properly correlated the work of each department. Before, such correlation had been impossible, owing to the large number of independent heads of sections and divisions in each department, who planned and executed the work more or less independently of one another. The official correspondence was also more closely centralized in the executive office of the Museum.

Anthropology.—In the Department of Anthropology a large amount of work was done by Mr. W. H. Holmes in reorganizing and installing the exhibits, under a general scheme approved early in the year. The organization of the department, the personnel, and the details of the work will be found in his report. There are a number of sections that have not yet been assigned to any division, remaining for the present under the direct supervision of the head curator. Moreover, the classification of material and the division of work among the various members of the present staff, so far as it has progressed, is largely tentative, owing to the staff being composed of specialists in limited portions of the field of anthropology; this necessitates a somewhat arbitrary

¹ The organization of the staff is given in Appendix I.

classification and organization. As the various branches of the work develop, and increase is made in the number of curators, reclassification of material and readjustment of the force will gradually lead to a satisfactory and permanent organization.

The accessions to the department were numerous and valuable. Among those of more notable importance is a collection of antiquities and ethnological material, the bequest of the late Mr. W. Hallett Phillips, of Washington, to the Smithsonian Institution. This collection is not only of great extent, but of exceptional value to archæological science. It contains 12,467 ancient relics, mainly stone implements from the Potomac region, and 106 ethnological specimens from Polynesia. By transfer from the Bureau of American Ethnology the Museum received material from Arizona, Arkansas, and Georgia; and by transfer from the Army Medical Museum, a collection of 2,206 human crania, representing mainly the Indian tribes, ancient and modern, of North America. There was received on deposit, and at the same time offered for sale, an extensive collection of stone implements and other ancient relics from various parts of Georgia, together with a collection of ethnological material from the Indians of the Great Plains and the Rocky Mountains, made by Emile Granier, of Paris. Valuable deposits were made by Prof. Alexander Graham Bell. These include a large number of pieces of apparatus made and used by him in his experiments and researches in various branches of electrical science. The General Electric Company also deposited many pieces of original apparatus connected with the early use of electricity for lighting, the transmission of power, and like purposes. Other valuable deposits are described in the report of the head curator.

During the year there were prepared by the curators and expert preparators of the department a number of models illustrating primitive life, processes, implements, utensils, etc.

The research work of the department during the year was extensive, the study, comparison, and classification of the collections before installation being essential to their intelligent utilization.

The system of installation inaugurated by Mr. Holmes is somewhat elaborate. The primary arrangement is founded, first, on the geographical or ethnographical assemblage, and, second, on the developmental or genetic assemblage. Other methods may be classed as special. They are the chronological, the comparative, the individual, etc. The primary methods are adapted to the presentation of the general truths of anthropology, and the special methods are available for limited portions of the field. A full description of the method of installation will be found in Mr. Holmes's report.

Biology.—The Department of Biology was embarrassed by reason of Dr. True's time being largely consumed in executive work, and it was not until late in the year that he secured an assistant curator to take charge of the work in the Division of Mammals.

In many ways the Department of Biology, when established at the beginning of the fiscal year, was in much better condition than either of the other two departments. The several zoological divisions already existing and the Division of Plants were brought together under a separate administrative head. As many of these divisions have been in existence since the reorganization of the Museum in 1881, and several of them for a much longer period, the organization of the department was a relatively simple matter. The biological specimens constitute the larger part of the Museum collections. They had been in charge of curators and assistants who followed the well-defined and long-established methods of systematic zoology and botany, and therefore no radical changes in the scientific methods or in the business administration of these divisions were required. The efforts of the head curator were largely in the direction of developing those features which, from various causes, had not had due prominence. He found the same difficulties met with by the other head curators in regard to laboratory and exhibition space and the force at his command. A large amount of the biological material is displayed in the Smithsonian building. The bringing together of all the invertebrates in this building was accomplished during the year, and this is a great gain in the classification of the exhibits. These collections include insects, mollusks, and all other classes of invertebrates. The display in Museum building includes the mammals, batrachians, reptiles, fishes, and the collections representing comparative anatomy. The birds remain in the Smithsonian building, it having been found impracticable to transfer this large exhibit to the Museum building.

The erection of galleries in the Museum building—a subject adverted to later—while not involving great changes in this department, as in the departments of Anthropology and Geology, rendered necessary the complete reinstallation of the large exhibition series of mammals. In the reinstallation Dr. True arranged the zoological exhibition on a faunal basis, special prominence being given to the faunas of the United States. This principal series is to be supplemented by various smaller series illustrating important topics in biology.

The additions to the zoological and botanical collections were numerous, and in some directions unusually important. The generous donation of Messrs. Hubbard and Schwarz of their collection of Coleoptera, principally North American, comprising about 200,000 specimens and representing approximately 12,000 species, is of great importance, as it places the National Museum in advance of all others as regards North American Coleoptera. Dr. W. L. Abbott continued his liberal gifts to the Museum by presenting large collections of birds, mammals, reptiles, insects, and other animals from lower Siam and Kashmir; and Dr. W. L. Ralph supplemented his valuable additions to the collections of birds' eggs. The largest acquisition to the mollusks consisted in the gift by Dr. R. Ellsworth Call of a collection including over 86,000 specimens.

Great activity prevailed during the year in the Division of Plants. Accessions to the number of 307 were made, including the purchase of all of the most valuable sets of American plants offered for sale that were needed to fill out the Government collections. This division is more fortunate than others in the Museum, having funds from which such purchases can be made.

The scientific bureaus of the Government, including the Fish Commission and the Biological Survey of the Department of Agriculture, continued to make very valuable additions to the national biological collections. A full description of these, and also of numerous additions from individuals, is given in the report of the head curator of the department, where also will be found the changes in the personnel and an account of the work for the year.

Geology.—In the Department of Geology Dr. Merrill gave a large portion of his time during the year to studying various European museums for the purpose of obtaining information as to the best cases and methods of installation of collections in museums. In addition to the head curator's absence, nearly all work was suspended in the exhibition halls during the construction of the new galleries and exhibition cases, so that little progress was made in the exhibition series during the first half of the year. Dr. Merrill resumed active charge of the department early in November, when he began a systematic examination of the written and printed records of the various exploring expeditions and surveys, with a view to ascertaining what geological material had been collected which could properly be considered the property of the Government, and what disposition had been made of the same. The law provides that collections made for the Government shall, when no longer needed for investigations in progress, be deposited in the National Museum.¹ It was found that this law had not in all cases been enforced, with the result that several important collections had not been transferred to the Museum, although several of the earlier exploring expeditions had passed out of existence, and in several instances the individuals making the collections had likewise passed away. It was decided to investigate all such cases. A fine collection of fossil fishes, made by the Hayden Survey, was obtained from the executors of Professor Cope's estate, and some other material is soon to be transferred by them. A request was made to the Geological Survey for any material that could be transferred without detriment to investigations in progress, assurance being given that the Museum could take charge of extensive collections. The Survey soon transferred a large

¹ "And all collections of rocks, minerals, soils, fossils, and objects of natural history, archaeology, and ethnology, made by the Coast and Interior Survey, the Geological Survey, or by any other parties for the Government of the United States, when no longer needed for investigations in progress shall be deposited in the National Museum." (Supplement to the Revised Statutes of the United States, Vol. I, second edition, 1874-1891, page 252.)

amount of good material, including in one instance two carloads of vertebrate fossils from the laboratories of Prof. O. C. Marsh, in New Haven, Connecticut.

The collection of fossil invertebrates was greatly enriched by two most important gifts. Through the bequest of the late I. H. Harris, of Ohio, the Museum came into possession of his private collection of over 20,000 specimens of fossils; this is particularly rich in many rare forms and a number of original types. From Mr. R. D. Lacoe, of Pittston, Pennsylvania, to whom the Museum was already so largely indebted, there was received a large collection of fossil insects, comprising upward of 4,600 specimens, of which more than 200 are types. Other valuable accessions are mentioned in the report of the head curator.

In the Division of Mineralogy satisfactory progress was made in the installation of the exhibition series. An immense amount of detail work in overhauling and classifying collections stored in boxes and drawers was accomplished. Owing to the pressure of other matters and the unsatisfactory condition of the exhibition halls, scarcely any investigations of note were undertaken by the curators.

GALLERIES.

The erection of the galleries in three of the halls and the four courts of the Museum building, under the acts of Congress approved June 11, 1896, and June 4, 1897, was completed during the year, with the exception of the permanent railings. This increased the available floor space of the Museum 17,000 square feet, or about one-sixth of the former exhibition space. The various wall exhibits that formerly extended to a greater height than the base of the galleries were removed early in the year, and after the galleries were completed many cases containing exhibits were placed on them. In addition to the galleries already completed, it was decided to construct other galleries affording a further floor space of 6,468 square feet, mainly for the purpose of securing more room for the library and for the preparation of exhibits.

ACCESSIONS.

During the fiscal year there were 1,441 accessions, containing upward of 450,000 specimens, the largest number for any one year during the past decade. The total number of specimens recorded to July 1, 1898, exceeds 4,000,000.

ATTENDANCE.

Owing probably to the national disturbance and distraction caused by the war, the attendance was less than during the previous year, when the multitude attending the Presidential inauguration ran the record unusually high. The following table shows that the number of visitors to the Museum since 1881 is 3,972,987.

Year.	Museum.	Smithsonian.
1881-1895.....	3,385,622	1,680,254
1895-96.....	180,505	108,650
1896-97.....	229,606	115,709
1897-98.....	177,254	99,273
Total.....	3,972,987	1,998,886

ADMINISTRATION.

The administrative work of the Museum was conducted most efficiently during the year, mainly by Dr. F. W. True, as executive curator, and for short intervals by Dr. G. P. Merrill and Mr. W. H. Holmes, respectively. Mr. J. L. Willige was acting chief clerk during the absence of Mr. Cox in connection with the Nashville and Omaha expositions. As chief of buildings and superintendence, Mr. J. E. Watkins took charge of the erection of the new galleries, and much of the success attending their construction is due to his careful supervision.

In conclusion, it is a pleasure to me to state that commendation is due the head curators and their assistants for the energy and patience they have shown and for their willingness to subordinate individual desires and preferences to the general welfare of the work of the Museum. It is owing to this *esprit de corps* that the work of the Museum progressed so satisfactorily during the year.

CONDITIONS AND NEEDS.

A national museum should be the center of scientific activity in the country in which it is located. In England the British Museum is the mecca of scientific men. The national museums in Paris, Copenhagen, Vienna, Berlin, and other capitals of Europe stand in similar relations to the scientific work of their respective countries. Such a relation the National Museum should hold to scientific men and affairs in America. It should receive and take care of all classes of material which have been or may be valuable for investigation or for the illustration of the ethnology, natural history, geology, products, and resources of our own country or for comparison with those of other countries. It should furnish material for all kinds of scientific investigations which deal with specimens or types, and give aid to such researches and publish their results. It should present by illustration such of the results of the scientific investigations of its corps of officers as are susceptible of such representation. It should cooperate with all of the higher educational institutions of learning in the country, and assist in the promotion and diffusion of knowledge in all of the lines of investigation which are carried on by them. It should provide library facilities, and, as far as can be done with justice to itself, aid all post-graduate students who may wish to take advantage of the generous provisions made by the Government for scientific investigations.

SPACE.

The growth of the U. S. National Museum was rapid under the successful charge of the late Dr. G. Brown Goode. When the character of the building and the funds available for its maintenance are considered, it compares favorably with any modern museum. It has received large collections from the scientific departments of the Government, and through private contribution (with some additions by purchase and exchange), all of which have been accommodated as well as could be in the inadequate laboratories, storerooms, and exhibition space. The galleries just completed have added 16,000 square feet of floor space, which will help to a certain extent to relieve the crowded condition of the exhibition halls and courts below. As an illustration of the present conditions and the necessity for more room, attention is called to the anthropological collections, which illustrate the development and progress of man and his works. If the material now in the possession of the Government in this department should be properly placed on exhibition, it would occupy the entire space in the present Museum building. The great collections in zoology, botany, economic geology, general geology, and paleontology should be entirely removed and placed in a building properly constructed for their study and exhibition.

Laboratory space.—In the present building there is a great deficiency in laboratory facilities. Curators and assistants are hampered for want of room in which to lay out, arrange, classify, mount, and label specimens. There should also be rooms in which students could bring together and compare various series of objects, and have at hand books and scientific apparatus. The present Museum building contains a few rooms suitable for the purposes mentioned, but the majority have to be used as storerooms, laboratories, and offices, and are therefore too much crowded to serve in any one of these capacities. Owing to the pressure for space, courts, halls, and galleries intended for exhibition purposes, both in the Smithsonian building and in the Museum building, are unavoidably occupied to a considerable extent as laboratories and storerooms. This lack of laboratory space is extremely detrimental to the interests of the Museum.

Quarters for storage.—Beyond six small basement rooms under two of the corner pavilions the present building has absolutely no provision in the way of basement or other rooms for the storage of collections which come in from day to day from Government field collectors or private donors, or such as are separated for distribution or held for the use of students. To remedy this defect many expedients have necessarily been resorted to, such as placing storage cases (faced with mahogany to make them presentable) in the exhibition halls, hiring storage rooms in private buildings, and filling up offices, entrances, staircase-landings, and passageways not absolutely indispensable. The ingenuity which has been exercised in this direction by some of the curators is very great and the annoyances that are daily endured in the interest of preserving the collections deserve notice. What is

needed is a series of spacious fireproof basements for the less perishable objects, the collections preserved in alcohol, and the ordinary stores and tools, and equally spacious dry lofts and rooms for those collections and stores which require protection from dampness.

Exhibition space.—The present Museum building, though large in extent, is overcrowded. It was built with the cheapest materials and under the cheapest system of construction. Its lack of architectural dignity and the indifferent character of the materials of which it is constructed give it the appearance of a temporary structure and tend to cheapen the effect of the really good cases and the very valuable collections which it contains. The visitor is everywhere confronted with rough walls, unfinished ceilings, and obtrusive trusses and supports. It should also be remembered that a considerable portion of the collections are still in the Smithsonian building, where the crowding is scarcely less than in the Museum building.

INCREASE IN THE SCIENTIFIC STAFF.

The head curators, curators, assistant curators, and aids, constituting the scientific staff of the National Museum, number in all 63 persons, divided among sixteen divisions. Of these, 26 are compensated for their services and the remainder serve gratuitously, being for the most part connected with other bureaus of the Government. The system of honorary curatorship, while admirable within restricted limits, is a disadvantage when carried to the present extent. Such a system has a disintegrating effect upon the organization, as the men are not entirely at the command of the administrative officers and are not obliged to serve at definite hours or under the ordinary restrictions of the paid curators. The number of honorary officers should be reduced by the substitution of a larger number of salaried officers.

The total number of scientific assistants should be very considerably increased, as nearly all of the divisions are short-handed and many of the collections do not receive the care they should have. At present there are not enough assistants who can serve as acting officers in a higher grade when the regular occupants of those offices are ill or necessarily detailed for service outside of Washington. Moreover, a museum can not be successfully carried on with intermittent service, and it is extremely desirable that there should always be a considerable number of young men learning the duties of scientific assistants, and thus making themselves capable of taking the places of the older men when the latter become incapacitated. There are now only four or five such young men in the Museum service.

PURCHASING AND COLLECTING FUND.

The National Museum has at present no regular fund for the acquisition of collections and special objects, and can only make purchases from a contingent fund which rarely exceeds \$3,000 or \$4,000, and which is likely at any time to be required for other necessary expenditures. For this reason, every year valuable collections which should be in the

hands of the Government, go abroad or to municipal museums or pass into the hands of private citizens. Money is also needed to fill out and make significant the various series already established in the Museum. The American Museum of Natural History in New York expends annually \$60,000 for the increase of its collections, and the Field Columbian Museum in Chicago has spent for collections during the last five years over \$419,000. Much of this was expended the first year, but material is purchased from time to time as it is needed to make collections more nearly complete.

No effort on any scale commensurate with the importance of the Museum has hitherto been possible in the direction of acquiring collections by field work and exploration. There are many kinds of collections that can be obtained only by scientific men working in the field. Collecting expeditions are often costly, but in many cases their results are such as can be obtained in no other way. There is no doubt whatever that it would be a very great advantage to the National Museum if it could every year, besides purchasing a reasonable amount of material, send out collectors to various regions to obtain objects which are never offered for sale, and which, if gathered by unskilled collectors, would lose all their value.

The experience of many years has shown that however active surveying and exploring expeditions may be, collections can not thus be made to grow symmetrically. There are always gaps which can be filled only by purchase of materials. It is often necessary, for purposes of comparison and for study, that the Museum obtain collections from abroad, and such as can be had also only by purchase or exchange. This fact is well recognized abroad, and the British museums and some of those on the Continent contain rarer and better specimens from America than do the American museums.

DISTRIBUTION OF SPECIMENS.

It is well known that the Museum distributes great quantities of duplicate specimens. This is a very important work and could be much extended if the scientific staff were larger. The work of bringing together, identifying, labeling, and preparing for shipment sets of specimens for educational institutions is very considerable, and consumes so much time that it can not be properly entered upon by the present force.

A NEW MUSEUM BUILDING.

The immediate and greatest need is a suitable museum building. The present building is 375 feet square. The space on the ground floor is 140,625 square feet, and that in the galleries 16,000 square feet; exhibition space 96,000 square feet. The entire cost was \$315,400.

For comparison with the above figures the following statistics relating to the American Museum of Natural History in New York are given. Total floor space, 294,000 square feet, divided as follows: Exhibition space, 196,000 square feet; laboratories, library, etc., 42,500

square feet; work rooms, storage, etc., 42,000 square feet; lecture hall, 13,500 square feet. These figures include the portions of the building now being completed. The total cost of the museum to date, including the completion of the new wings, is \$3,559,470.15. The buildings and the care of them are provided for by the city of New York. The expenses of the scientific staff, increase of collections, etc. (the income for which the present year is approximately \$185,000), are defrayed from endowments, membership fees, and contributions.

The present National Museum building was erected with the view of covering the largest amount of space with the least outlay of money. In this respect it may be considered a success. It is, in fact, scarcely more than the shadow of such a massive, dignified, and well-finished building as should be the home of the great national collections. There is needed at once a spacious, absolutely fire-proof building of several stories, constructed of durable materials, well lighted, modern in equipment, and on such a plan that it can be added to as occasion demands in the future. A site for such a building is already owned by the Government; only the building needs to be provided for. What the Capitol building is to the nation, the Library building to the National Library, the Smithsonian building to the Smithsonian Institution, the new museum building should be to the National Museum.

Exhibition and laboratory space.—If the present building were devoted to the Department of Anthropology, in the new building there should be provided fully 115,000 square feet of exhibition space for the Department of Biology, and for its laboratory and office rooms 75,000 square feet, making a total of 190,000 square feet. The space mentioned is based upon careful estimates of what will be needed for the proper housing of and work on the collections now in hand and that will probably come to the Museum within the present generation. It would be provisionally assigned among the different divisions of the department as follows:

Space needed by the Department of Biology.

Division.	Exhibition space.	Laboratory and office space.	Grand total.
	<i>Sq. feet.</i>	<i>Sq. feet.</i>	<i>Sq. feet.</i>
Mammals	23,500	14,000	37,500
Birds and birds' eggs	12,000	7,600	19,600
Reptiles and batrachians	4,500	3,600	8,100
Fishes	8,000	8,300	16,300
Mollusks	4,200	8,000	12,200
Insects	3,500	7,000	10,500
Other invertebrates	10,000	10,500	20,500
Comparative anatomy	5,000	3,500	8,500
Herbarium	20,000	12,500	32,500
A "Cetaceum," or special hall for whales	2,500	.....	2,500
Special series:			
Synopsis series, protective coloration, mimicry, albinism, melanism, etc.	22,000	.....	22,000
Total	115,200	75,000	190,200

It is estimated that 65,000 square feet of exhibition space will be needed in the Department of Geology and 18,000 square feet for its offices and laboratories.

In addition to the laboratories for biology and geology there should also be provided 5,000 square feet of laboratory space for the use of post-graduate and special students who come to Washington to avail themselves of the exceptional opportunities for study offered by the materials brought together in the National Museum and by the investigations carried on in the various scientific bureaus.

There will also be needed a considerable portion of the basement of a building for rough storage, preparators' shops, taxidermists' rooms, etc.

Lecture hall.—The need of a suitable lecture hall is imperative. The lecture hall of the American Museum of Natural History has 13,500 square feet of floor space and that of the Field Columbian Museum 4,250 square feet. A suitable hall for the National Museum should include at least 6,000 square feet, and there should also be one or two smaller rooms that could be used for lectures on special topics, when a small audience only is expected.

Summary of space needed by the National Museum.

	Square feet.
Department of Biology.....	190,000
Department of Geology	83,000
Special laboratories for students	5,000
Rough storage, workshops, etc.....	20,000
Lecture hall	6,000
	304,000
Present Museum space, to be devoted to the Department of Anthropology..	96,000
Total.....	400,000

The American Museum of Natural History, which has 294,000 square feet of space, has so planned its buildings that additions can be made to them as rapidly as funds are available and the increase of the collections demand the space. Less than one-fourth of the structure as originally planned is completed.

FUTURE DEVELOPMENT OF THE NATIONAL MUSEUM.

With suitable buildings provided, the immediate development of the National Museum naturally lies in three directions. First, the occupation of the present building by the anthropological collections; second, the housing, developing, and installing of the great biological collections, and third, the development of a great museum of practical geology.

First.—The collections in anthropology, as they stand to-day, cover a wide field in a broken and disconnected way. It is difficult to use them effectually to illustrate the great features of this branch of science. They do not present a connected story of the peoples and cultures of the world. This arises from the gaps in the collections and the absence of suitable laboratory and exhibition space. This depart

ment should have adequate representations of the American peoples and their culture, not only of our own country, but of the whole American continent. Our nation is the only one in America that can reasonably be expected to do anything of importance toward the preservation of the materials necessary for the illustration of this vast field, and as the American race is a unit, of which the tribes in our own territory constitute but a fragment, it appears to be our duty to take up this work in a comprehensive way. Thus would be built up not only a national museum but an American museum in the widest sense. This applies not only to anthropology but to the other great departments of the Museum. It will be impossible to carry on such a work without turning over to the Department of Anthropology the entire present building, with all of its laboratory and exhibition space.

Second.—The Department of Biology now occupies a large exhibition space in the Smithsonian building and 55,000 square feet in the National Museum building. Large collections, which would be placed on exhibition if space were available, are stored in laboratories and inclosed spaces in the exhibition halls. As has already been explained, in a new building there should be available for the Department of Biology 190,000 square feet of exhibition, laboratory, and storage space.

The present exhibit is more complete than that of the other departments of the Museum. Of birds there is a large mounted series, one of the finest in existence, but it is so indifferently housed that it fails to make the impression it should. Of mammals there is a good North American series and some excellent examples of exotic species. There is a good and rather large exhibit of the various groups of the lower forms of animals, including an especially fine series of corals and sponges.

These are the only series at present exhibited which can be considered at all comprehensive. Of the great groups of fishes, reptiles, and amphibians there is room only for an outline representation. The wonderful variety of form among insects can be scarcely more than suggested in the space available. Of plants there has hitherto been no exhibit worthy of the name, and the space which it has now been possible to set aside is entirely out of proportion to the vast extent and importance of this great kingdom of nature.

Every natural-history museum of the first class should have at least two comprehensive exhibition series—first, the *Systematic Series*, representing the natural groups among which all animals and plants, from the highest to the lowest, are divided; second, the *Faunal and Floral Series*, showing the animals and plants characteristic of each of the grand divisions of the earth's surface which naturalists have established as a result of their studies of these two kingdoms of nature.

These two great comprehensive exhibits should be supplemented by a number of *Special Series*, illustrating the more interesting phenomena and phases of life, such as the macroscopic and microscopic structure of

animals and plants and their development from the germ to the fully adult individual, and special modifications of form and color by which animals are protected from their enemies, the adaptations for peculiar environments and modes of life, the characteristics of youth, maturity, and old age, the variation in form, size, and color among individuals of the same species, the domiciles and other works constructed by birds, mammals, insects, and the like.

To these series should be added another of great importance, the *Economic Series*, representing the animals and plants as related to the activities and needs of man.

Any one of these principal series in its full development would more than fill the entire space now available.

Third.—There should be developed a museum of practical geology in the broadest sense, which will be of service to every producer and consumer of American mineral products, and to all students of geology who are engaged in either economic or purely scientific investigations.

In addition to the series of rocks and fossils illustrating the stratigraphy and succession of the sedimentary rocks and the systematic collection of minerals and ores, an exhibit showing how geologic work benefits the daily life of the people should be developed. An illustration of this would be a representation of the artesian water supply of the semiarid region, showing the stratification and structure of the sedimentary rocks, and how hydrographic and geological investigations clearly indicate the regions in which artesian water development may be carried on successfully. Mining and areal geology could also be illustrated in such manner as to place before the student and intelligent observer the import and value of such work.

In most museums the principal effort has been to make a collection of useful mineral products. This is desirable, but from a broad view of illustrating the practical in addition to the scientific side of geology it should be secondary. The best basis for classification on the practical side of the museum exhibit appears to be the finished mineral product. For instance, if pig iron be taken as a key material in classification, the iron ores from which it has been obtained should be arranged so as to show the various kinds whose combination has resulted in the final result as pig iron. In connection with this should be grouped the geological phenomena, which should include representations of any geological conditions connected with the original deposition and the occurrence of iron ores. This might include the conditions which have led to the oxidation of pyrite and other sulphur compounds of iron, and to the development of hydrous oxides of iron; also an illustration of what has been demonstrated in regard to the solution of widely distributed minerals in certain rocks and their subsequent concentration in ore bodies by metasomatic action. All of the metals could be arranged under such a classification, as also the nonmetallic products. To prepare such an exhibit would require many years of work, the details of which would be considered as each mineral product was taken in hand.

Some of the preceding suggestions have been adopted by the Museum authorities and partially put into execution, and the carrying of them out is dependent upon enlarged facilities for laboratory work and exhibition space. During the administration of Dr. Goode, the Museum developed as far as possible under the conditions surrounding it. No one knew better than he that only by securing new buildings and expanding the Museum could it take the place in America that the several national museums of Europe had taken in their respective countries. It is well recognized that a public museum is a necessity in every highly civilized community, and that, as has been so well stated by Dr. Goode, "the degree of civilization which any nation, city, or province has attained is best shown by the character of its public museums and the liberality with which they are maintained." At present New York City is, in this respect, in advance of all other American cities and of the National Government. Whether the latter will take its proper place by developing the National Museum as it has developed the National Library remains to be seen. The question whether they are willing to be represented by the Museum as it is to-day is before the American people.

REPORTS OF HEAD CURATORS.

REPORT ON THE DEPARTMENT OF ANTHROPOLOGY By WILLIAM H. HOLMES.
REPORT ON THE DEPARTMENT OF BIOLOGY By FREDERICK W. TRUB.
REPORT ON THE DEPARTMENT OF GEOLOGY By GEORGE P. MERRILL.



REPORT ON THE DEPARTMENT OF ANTHROPOLOGY FOR THE YEAR 1897-98.

By WILLIAM H. HOLMES,
Head Curator.

It is convenient to present the matter of the present report under the following heads:

- I. General administrative work.
- II. Acquirement of Museum materials.
- III. Preservation of collections.
- IV. Classification and research.
- V. Installation.
- VI. The Anthropological exhibit at the Trans-Mississippi and International Exposition.

GENERAL ADMINISTRATIVE WORK.

A partial reorganization of the Museum made at the beginning of the year resulted in the formation of three departments, one of which is Anthropology. The various divisions and sections dealing with man and his works, which have been conducted independently of one another, the curators and custodians reporting directly to the Assistant Secretary in charge of the Museum, are now united under a head curator of anthropology. This operates to give direct expert supervision of all the divisions and properly correlates the various branches of a complex work. The head curator took charge October 1, 1897, and a number of changes were made in the scientific staff of the department and in the limitations of the fields occupied by the various curators and custodians. The present organization is indicated in Appendix I.

There are a number of sections included in the department not yet assigned to any one of the above divisions, and these remain for the present under the direct supervision of the head curator. The present classification of the material and the assignment of the staff are by no means final. It was found impossible to devise a scheme that would satisfy the requirements of scientific classification and at the same time accommodate itself to the acquirements of the present staff, which is composed of persons devoted each to special portions of the field of anthropology. It is expected that as the various branches of the work become fully developed and the collections are enriched and rounded out so that a systematic treatment of the whole field is possible, the questions of reclassification and rearrangement of the force will gradually adjust themselves.

The clerical and other nonscientific work of the department has been conducted as in preceding years, save that some changes in routine, intended to facilitate the transaction of business, have been introduced. Official correspondence is carried on almost wholly through the Museum Office of Correspondence and the executive officer of the Museum. The records are thus less scattered and more generally accessible than if in the hands of many individuals. The work of receiving, recording, marking, and placing accessions is well provided for in the official routine, and the necessary poisoning of specimens, repairs, making of replicas and models, the building of group exhibits, etc., are in the hands of expert preparators.

During the year two notable episodes have diversified the work of the department, viz, the building of galleries, and the preparation of exhibits for the Trans-Mississippi Exposition held in Omaha. Iron galleries were constructed in four of the seven anthropological halls and this has not only seriously interfered with the progress of installation, throwing the halls affected into confusion for several months, but has made it necessary to reinstall the major part of the exhibits in all the halls. From year to year the spaces have become gradually overcrowded with exhibits, and the opening of the galleries afforded the opportunity of relieving the congestion in part. The first step in this reassemblage of collections was the selection of furniture to accord with the spaces and the collections, and the head curator has devoted much time to the utilization of the various styles of cases to the best advantage. Necessary alterations and repairs were made in cases, pedestals, screens, etc., as the work progressed. In reassembling the furniture, much attention was given to the opening of thoroughfares, the widening of spaces, and in systematizing and simplifying the installation. The work on the main floor is now well advanced, but, in the galleries where wall cases are in process of construction and in halls where floors are being laid, it remains far from complete.

For a period of three months, ending with June 1, the energies of the department were largely devoted to the preparation of an exhibit for the Trans-Mississippi Exposition, a detailed account of which is given in another place.

ACQUIREMENT OF MUSEUM MATERIALS.

A primary function of the department is the acquirement of Museum materials. These materials include specimens and the data relating to them. Specimens consist of the actual objects, derived from every part of the anthropological field, and of models and casts, as well as of photographs and other representations of the actual objects. The channels through which they are acquired are (1) gift; (2) transfer (from the Smithsonian Institution and departments of the Government); (3) purchase; (4) collection; (5) exchange, and (6) manufacture. To these materials are added deposit or loan collections, the treatment of

which is identical with that of bona fide acquisitions. The administration of the function of acquisition in the department is uniform with that of other departments.

Gifts.—The accessions for the year have been numerous and valuable, and details relating to them will be found in another place. Among the gifts are some of notable importance. A collection of antiquities and ethnological material, the bequest of the late W. Hallett Phillips, of Washington, is not only of great extent but of exceptional value to archaeological science, having been collected and recorded with care by Mr. Phillips, who was a conscientious and discriminating devotee of archaeological research. The collection contains 12,467 ancient relics, mainly stone implements from the Potomac region, and 106 ethnological specimens from Polynesia. The latter material was collected by Mr. Henry Adams, of Washington, during a prolonged voyage among the Pacific islands.

Transfers.—The Smithsonian Institution, through the agency of its Bureau of American Ethnology, has acquired by purchase and transferred to the Museum two collections of importance—a valuable series of ancient stone and earthenware utensils from graves and mounds in Arkansas, and a collection of antiquities from mounds of the well-known Etowah group of Georgia, made by Dr. Roland Steiner, of Grovetown, Georgia. The latter lot, together with the material previously obtained from the same locality by agents of the Bureau of Ethnology, forms one of the most instructive assemblages of archaeological material ever brought together from the mound region.

A noteworthy accession of the year is a collection of 2,206 human crania transferred to the Museum from the Army Medical Museum, through the courtesy of Surgeon-General G. M. Sternberg. This collection has been accumulating for many years and represents mainly the Indian tribes, ancient and modern, of North America. Much of the material was acquired through National Museum agencies and was turned over to the Medical Museum for the benefit of the corps of students of physical anthropology connected with that institution. It includes only nonpathologic remains and is to form the nucleus of a division of physical anthropology in the Anthropological Department.

Deposits.—Of the various collections loaned to the Museum during the year, and at the same time offered for sale, two are of more than usual importance. (1) A very extensive series of stone implements and other ancient relics from various parts of Georgia, owned by Dr. Roland Steiner, and (2) a collection of ethnological material from the Great Plains and Rocky Mountain Indian tribes, made by Emile Granier, of Paris. It is expected that these collections will be acquired by the Museum at an early date. Other loan collections worthy of note are (1) a series of personal mementos of Gen. W. S. Hancock, deposited by Cadet G. R. Hancock, of West Point Military Academy, and a number of important Jewish religious ceremonial objects deposited by Mr.

H. E. Benguiat. A valuable collection of Japanese porcelains, loaned by Miss E. R. Scidmore, is now installed in the Gallery of Ceramics.

The Section of Electricity, Division of Mechanical Technology, has been especially fortunate in acquiring material, and the following statement of Mr. G. C. Maynard, custodian of the Section of Electricity, is quoted from the report of Mr. J. E. Watkins, curator.

One of the most important accessions received during the year is an extensive collection of apparatus deposited by Prof. Alexander Graham Bell. This deposit embraces a large number of pieces of apparatus made and used by Professor Bell in his experiments and researches in various branches of electrical science. The invention and development of the speaking telephone, from the first crude experimental device to the most perfect instrument now in use, is clearly illustrated by a series of objects showing the various advancing steps by which the new art of telephony was created.

Another interesting portion of the collection is the apparatus devised and used by Mr. Bell in his photophonic experiments, including the original instrument with which, on the 2d of June, 1880, he successfully transmitted articulate speech by means of a beam of light from the roof of the Franklin School building, in Washington, to his laboratory on L street, a distance of 213 meters. Mr. Bell contributed his original induction balance apparatus, including that devised by him for the purpose of locating the bullet in the body of the late President Garfield, and similar apparatus of later dates. In addition to the above the accession includes Bell's multiplex telegraph instruments, his induction balance audiometer, for testing hearing, and an Edison phonograph of the earliest pattern, in which the sound waves are recorded on a sheet of tin foil.

The deposits made by the General Electric Company are of much interest and value. Among the historical objects are the first Thomson-Houston three-coil, arc-light dynamo, made in 1879, which formed the basis of the Thomson-Houston electric lighting system, the first automatic regulator used with this machine, a dynamo and electric motor used in the Thomson-Houston factory at New Britain in 1880-1881, the first electric welding machine made by Thomson, and many other pieces of original apparatus connected with the early use of electricity for lighting, the transmission of power, and other purposes. Another contribution from the same company is one of the first incandescent electric-lighting dynamos, made and put in operation by Edison in 1879, on board the steamship *Columbia*, of the Oregon Steamship Navigation Company, which was the first steamboat equipped with incandescent electric lights. This dynamo was continued in active use for a period of nearly twenty years, and is still serviceable. Especial interest attaches to this machine for the reason that it is one of the first lot of four dynamos made in this country for commercial incandescent electric lighting. One of the others formed part of the equipment of the polar exploring vessel *Jeannette*, commanded by Captain De Long, on its cruise into the Arctic Sea, where it was lost in 1882. Contributions of a series of historical incandescent lamps and specimens of insulated conductors have also been received from the General Electric Company.

The Coe Brass Manufacturing Company, of Ansonia, Connecticut, through its president, Mr. George F. Brooker, presented to the Museum ten dynamos made between the years 1873 and 1879, by William Wallace, for the generation of electricity for electric lighting, electroplating, and other purposes. Some of these machines were in practical operation during the Centennial Exposition at Philadelphia, and are said to be the first arc-light dynamos used for public lighting in this country.

An electric generator of still earlier date than any of those referred to was made by Charles A. Seeley in 1867. In regard to this machine it is said that early in the year 1867, when the principle of self-excitation in dynamos was new, and in fact

practically unknown except to a few of the most advanced electricians in this country, the subject of electric lighting was broached by Professor Seeley to Mr. Horace Greeley. Mr. Greeley became deeply interested and highly amused at the idea of grinding out electricity with a crank and then making light of it, as he expressed his understanding of Professor Seeley's description of an arc light operated by a dynamo. Mr. Greeley suggested that Seeley should build a dynamo and other apparatus, which were accordingly started at once. The satisfactory results of the experiment led to the publication of an editorial in Mr. Greeley's paper, the *New York Tribune*, on March 28, 1867, which foreshadowed the success that has since been attained in the art of electric lighting. The Seeley dynamo and the original electric motor and railway devised in 1834 by Thomas Davenport, who was the first inventor of a method of applying galvanism to produce rotary motion, were received as a deposit from the American Institute of Electrical Engineers through Ralph W. Pope, the secretary of the organization.

The dynamos added to the section during the year represent almost the entire range of American inventions which form the basis of the practical methods of electric lighting, both by arc and incandescent lamps, and mark an important epoch in the history of artificial illumination. Duplicates of few, if any, of these machines are in existence.

A Morse telegraph register, presented to the Smithsonian Institution by Prof. Henry Ortmann, of Baltimore, by direction of the late Rev. Henry Schieb, appears to be of especial interest. The instrument was in the possession of Mr. Schieb for many years, and is said to have been used on a private telegraph line operated by him and Professor Morse prior to the building of the public line between Washington and Baltimore in 1844.

Mr. Edward L. Morse has during the year deposited several instruments and documents relating to his father's telegraphic inventions.

There have been added to the Henry collection a number of experimental electrical instruments found by Miss Mary A. Henry in the possession of Miss Annie Wrightsen, of Albany, from whom the apparatus was purchased.

Results of exploration.—Explorations begun during the preceding year, under the auspices of the Bureau of American Ethnology, have yielded material of great value. Excavations conducted by Dr. J. Walter Fewkes, near Tucson, Arizona, have resulted in the acquisition of some 1,300 specimens of pottery and other classes of relics, and Mr. J. B. Hatcher, collecting for the Bureau of Ethnology, has forwarded a number of unique ethnological specimens from Patagonia. Explorations undertaken in Brown County, Ohio, by Mr. Gerard Fowke, also for the Bureau, yielded a limited collection of relics from stone-grave burials of the mound-builders.

Exchange.—The exchanges have not been important, although collections of considerable value have been acquired, as follows: (1) Various ethnological and archaeological objects from South America in exchange for pueblo collections with the Field Columbian Museum, of Chicago. (2) A series of flint nodules, flaked flints, and flint working tools from the gun-flint factories of Brandon, England, in exchange for chert quarry refuse from Indian Territory.

Manufacture.—The department relies for many of its most interesting and instructive exhibits upon the skill of its curators and expert preparators. During the year a number of models have been prepared illustrating primitive life, processes, implements, utensils, etc., and

numerous reproductions of objects of interest, in plaster, have been made.

Notwithstanding the large number of accessions and their undoubted value, it should be noted that the results of the year's collection are not wholly satisfactory. The meagerness of funds for purchase has made it impossible to secure some of the most important collections offered, and as no provision is made for exploration and systematic expert collection, it is found that, save for the occasional well-ordered collections donated or transferred, the acquisitions are fragmentary and lack the detailed data so essential to the student engaged in research.

PRESERVATION OF COLLECTIONS.

Following the acquisition of museum materials are various steps looking to their preservation. The collections for the year have been accessioned, recorded, and marked as usual, and have been stored or placed in the study or exhibition series by the curators. The department suffers much inconvenience from lack of space and facilities for handling the collections. Instead of a well-ordered laboratory in which to open, spread out, examine, compare, and classify specimens as they arrive or as subsequent research goes on, small portions of the exhibition halls have been screened off for the purpose, thus interfering with installation, and often rendering hasty removals and premature storage necessary. At the close of the year one entire gallery is devoted to laboratory uses and is thus necessarily closed to the public. I regard the lack of laboratory space as extremely detrimental to the interests of the department.

A large part of the ethnological collections require expert attention on their arrival in the Museum. They are unclean and infested with destructive insects, and experienced preparators are required for cleaning and preserving. The latter work is carried on in a small shop in an outbuilding. This is very inconvenient and requires the removal of the collections to be treated from the Museum building to one which is by no means a safe repository for valuable specimens.

The question of storage of material has arisen many times during the year, and numerous collections have been removed to storage. The exhibition halls, although much less crowded than at the beginning of the year, still contain more material than can be properly exhibited. The total surplus is, therefore, very great. The present exhibits occupy 60,000 square feet of space, the entire floor space of the Museum being only about 100,000 feet. The anthropological collections properly installed would fill the entire Museum building.

CLASSIFICATION AND RESEARCH.

The third important function of the department relates to the use of the collections in conducting researches looking to exhibition and publication. All possible information relating to the specimens is secured,

and they are studied, compared, and classified. This work is essential to their intelligent utilization, and necessarily precedes installation and publication. It is the work which most constantly employs the attention of the curators and is referred to at length in the reports which they have submitted.

Researches having in view publication of results have been conducted by Prof. O. T. Mason, Dr. Walter Hough, Mr. J. E. Watkins, and Dr. Thomas Wilson. In several cases collectors have engaged in the study of the collections made by themselves. This is true especially of Dr. Fewkes, Mr. Cushing, Mrs. M. O. Stevenson, and Mr. Stewart Culin. Mr. J. D. McGuire has prepared a monograph on tobacco pipes, employing the collections of the Divisions of Ethnology and Prehistoric Archaeology, and Dr. Edward Eggleston, and Dr. H. Carrington Bolton have made studies of portions of the Copp collection of colonial relics in the Division of History and Biography.

INSTALLATION.

Display of collections constitutes a most important function of the Museum; it may be regarded as the essential function, since all others are as well subserved by the storehouse and laboratory. Public display is the feature that gives the Museum its status as an educational institution. The all-important question then is, in what way and by what methods shall the department undertake to instruct by means of its exhibits? Exhibition is not regarded simply as the presentation of the materials of a museum so that the public may see them. The essential point is the presentation in such logical order that the great truths of human history may be told in the briefest and clearest way.

There are several methods of presenting the materials of anthropology, but two of these are of primary importance and are used to the practical exclusion of the others. The first is the *geographical* or *ethnographical* assemblage, and the second the *developmental* or *genetic* assemblage. Other methods may be classed as *special*; they are the chronological, the comparative, the individual, etc. The first mentioned methods are adapted to the presentation of the general truths of anthropology, and the special methods are available for limited portions of the field—for special or limited ideas which are to be fully elaborated.

THE GEOGRAPHICAL OR ETHNOGRAPHICAL ARRANGEMENT.

The most natural assemblage of the materials illustrating the peoples of the world is in groups related one to another as are the peoples themselves in more or less well-defined geographical divisions. Thus assembled it is possible for the student or the ordinary museum visitor to make his studies pretty much as he would make them in traveling from country to country. The museum on this plan is a miniature world, so far as the objective materials of anthropology are capable of

constituting such a world. Under this method of classification all collections coming into the possession of the Museum may be intelligently assembled. From this assemblage, whether as exhibition or study series, selections of duplicate objects may be made for building up exhibits illustrating the history of man as seen from other points of view.

The materials employed in this grand division of the exhibits are not yet brought together in the Museum in their final relationships. The collections relating to living tribes and nations are separated from those representing prehistoric peoples of the same areas, the latter occupying the great hall of the Smithsonian Institution. It is hoped that in the near future the construction of a new building, or a reassignment of the present Museum spaces, may lead to the proper correlation of these important exhibits.

THE DEVELOPMENTAL ARRANGEMENT.

The second grand division of exhibits assumes to present selected portions of the collections on a totally different plan from the preceding, and they are thus made to record and convey a totally distinct class of ideas. The story told by these exhibits is not that of tribes or nations and their connection with particular environments, but that of development of the race along the various lines of culture progress, each series beginning with the inceptive or lowest stages and extending to the highest. These series are synoptic in character.

The following exhibits arranged on this plan have already been assembled or are in process of segregation:

Fire making	1 series	Glass	1 series
Hunting	1 series	Enamel	1 series
Fishing	4 series	Metallurgy	4 series
Agriculture	2 series	Sculpture	4 series
Weapons	6 series	Graphic arts	4 series
Tools of general use	8 series	Metric arts	3 series
Culinary arts	4 series	Music	4 series
Illumination	3 series	Medicine	1 series
House building	1 series	Photography	3 series
Textiles	3 series	Transportation	10 series
Costume	2 series	Electricity	8 series
Ceramics	3 series		

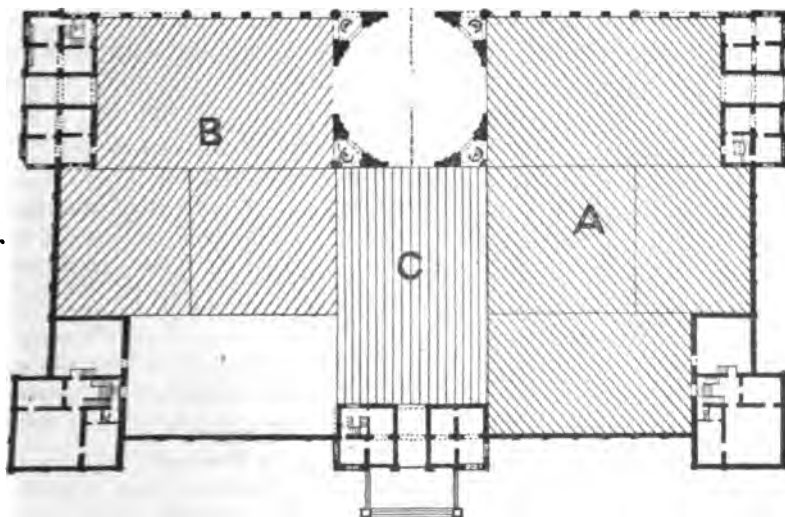
Each specimen in these series stands not as an isolated product of activity, but for an idea—a step in human progress; each series is a logical assemblage of these ideas—these steps in human progress, and the order is such as to suggest to the mind the broader truths of human history. The group of series properly arranged serves to illustrate the development of human thought and the gradual expansion of human interests.

SPECIAL ASSEMBLAGE—CHRONOLOGICAL, CYCLOPEDICAL, COMPARATIVE.

There are innumerable subjects covering limited portions of the anthropological field that call for special elaboration and separate assemblage of materials. The history of a single nation may be thus treated, as, for example, the history of the United States, a most appropriate subject for our National Museum; the history of France, appropriate to a French museum, the order of presentation being chronological. An elaborate assemblage of exhibits may be made for cyclopedical or reference use merely, as in the case of our former section of materia medica, but this method is not applicable to any large portion of the field of anthropology. Other exhibits still may serve for purposes of comparison of what different peoples do living under distinct environments, as, for example, the series of drinking vessels in the East Hall; or what has been accomplished by different nations or establishments, as in the ceramic section.

PLACEMENT OF EXHIBITS.

The accompanying ground plan will serve to indicate the distribution of the grand divisions of exhibits in the Museum building. The collections of prehistoric archaeology, placed in the great hall of the Smithsonian Institution, belong to Group A.



Grand divisions of anthropological exhibits in the Museum building.

The areas occupied by the three grand divisions are indicated by letters as follows:

- A. Geographical presentation of men and culture.
- B. Developmental presentation of human activities.
- C. Special presentations of activities and phenomena.

Four great halls and their galleries are devoted to exhibits assembled on the geographical plan (A), the peoples of the world being repre-

sented with as much completeness as the limitations of the national collections will permit. Three of these halls are occupied by American materials and one by exhibits representing the remainder of the world.

In the West North Range or Catlin Hall (formerly the lecture hall) are brought together, for the first time in any degree of completeness, very extensive collections obtained from Indian tribes of the great region which extends from the Atlantic coast to the Rocky Mountains. These are arranged primarily by provinces, and secondarily by stocks and tribes, but as yet they are only tentatively placed, as the entire hall is to be cleared in the near future for laying a floor and building galleries.

The walls of this hall are completely covered with portraits and scenes representing mainly the great group of tribes assigned to the hall. They are the work of George Catlin, the noted traveler and artist. To this hall are assigned also various groups of lay figures illustrating the tribes concerned, and the windows are to be embellished with a series of photographic transparencies covering the same ground.

The hall known as the Northwest Range contains collections from numerous Indian tribes of the northwest coast region, assembled at the north end, and very complete exhibits from the Eskimo tribes of the arctic regions, assembled in the south end of the hall.

The Northwest Court (Pueblo Court) contains exhibits pertaining to the great group of town-building tribes of Arizona, New Mexico, and adjacent sections, known as Pueblo (town) Indians. The antiquities of the region are also included, as they are known for the most part to pertain to the same general group of peoples. The collection of pottery is very extensive, and the series of lay-figure industrial and ceremonial groups make the display more than usually attractive.

In the gallery of this court are assembled, though not yet fully installed, collections from the tribes of the great arid region of the Southwest, other than the Pueblos, as well as limited series of objects representing the tribes of Mexico, Central America, and South America.

The West Hall contains extensive collections from a multitude of peoples of Europe, Asia, and Africa, and the gallery in the north side is occupied by materials from Australia and the Indo-Pacific Islands.

Grand Division B, which includes exhibits arranged to illustrate the progress and achievements of the race in many of its principal arts and industries, occupies three halls and two galleries in the northeast section of the building. A few additional exhibits belonging to this division are still installed in other sections of the Museum. The principles upon which they are assembled have been explained elsewhere. In East Hall adjoining the Rotunda is placed a group of exhibits epitomizing the history of various arts, domestic and industrial. In the eastern portion of the hall are collections illustrating transportation, electricity, physical experimentation, etc.

The Northeast Range (Boat Hall) is occupied by a very extensive

collection of boats, models of boats, and other exhibits exemplifying the development of water transportation, and especially the progress in steam navigation achieved in recent years by American inventors.

The Northeast Court, main floor, contains the remarkable collections illustrating the graphic arts brought together by Mr. S. R. Koehler, honorary curator, and the gallery is devoted to ceramics and examples of art products in glass, enamel, lacquer, metal, and ivory.

The exhibit of *materia medica*, brought to a high degree of completeness by the honorary curator, Dr. J. M. Flint, U. S. N., is installed in the East Hall Gallery (north side). The more comprehensive title of Division of Medicine having been substituted for that of "*materia medica*," heretofore used, it is proposed to arrange and develop the collection on the lines adopted for other branches of human activity, and to attempt to illustrate the history of medicine, or the evolution of ideas concerning disease and its treatment. The following provisional classification is taken from Dr. Flint's annual report:

A. Magical Medicine.

1. Exorcism, invocation, and incantation.
2. Amulets, talismans, and fetiches.

B. Psychical Medicine.

1. "Laying on of hands."
2. Suggestion.
3. Hypnotism.
4. Faith cure.

C. Physical and External Medicine.

1. Baths, massage, exercise, electricity.
2. Surgery, including acupuncture, cautery, blood letting, and surgical operations in general.

D. Physiological or Internal Medicine.

1. Drugs (illustrations arranged in the following groups: (a) Egyptian medicine; (b) Greek medicine; (c) Hindoo medicine; (d) Arabian medicine; (e) Oriental medicine; (f) Indian medicine; (g) Modern medicine.

E. Preventive Medicine.

1. Water.
2. Air.
3. Food.
4. Beverages and condiments.
5. Soils.
6. Habitations.
7. Clothing.
8. Climate.
9. Disposal of the dead.
10. Disinfection.

The third grand division of exhibits, the *Special*, is represented by a number of collections of importance. The North Hall is occupied by a large series of exhibits arranged chronologically to illustrate the history of the United States. Beginning at the left, just within the north door, the period of discovery is presented. This is followed in order by the Colonial and Revolutionary periods, the war of 1812-14,

the Mexican war, etc. Continuing on the west side are collections illustrating the period of the civil war and notable personages and episodes pertaining to it and to succeeding periods.

The Division of Religions occupies the West Hall Gallery (south side), where interesting exhibits are assembled in groups illustrating the Jewish, Mohammedan, Buddhistic, and other religions. The large collection of musical instruments occupies the wall cases of the North Hall; various collections of ceramic products, glass, metal work, etc., grouped by peoples or manufacturing establishments, are placed in the gallery of the Northeast Court, and exhibits illustrating the composition of the human body and the analysis of foods and drinks occupy part of the East Hall Gallery (north side).

**ANTHROPOLOGICAL EXHIBIT OF THE U. S. NATIONAL MUSEUM AT
THE TRANS-MISSISSIPPI AND INTERNATIONAL EXPOSITION.**

The frequency with which the National Museum has been called upon to prepare exposition exhibits has made it somewhat difficult to secure fresh and interesting material for display. To obviate this difficulty in the Department of Anthropology it was decided to assemble the limited group of exhibits required on a plan differing essentially from that adopted for previous expositions.

Heretofore the materials have been brought together in a somewhat disconnected way, to illustrate particular peoples, or especial arts or industries as represented by their products. On the present occasion the activities of man are treated from the point of view of their development. The various lines of progress are represented by a series of objects, each typifying a step in the industrial and intellectual evolution of the race.

As the exhibits required had to be drawn from all divisions of the department, a single series of objects in many cases being made up from the collections of two or more divisions or sections, members of the anthropological staff were called upon to act as committees in assembling the exhibits in which they were personally concerned. The full resources of the Museum were thus drawn upon, yet the objects taken were so few in number as not to interfere seriously with the present Museum installation.

Each series of exhibits epitomizes a single branch of art or industry and occupies a single case-front or fraction thereof, and may thus be conveniently seen at one view. The scheme of treatment or presentation is just such as the systematic student would adopt in writing the history of the subject, beginning with the inceptive stages and moving forward step by step to the highest development. The following subjects are presented, beginning at the left in the cases and progressing toward the right:

The use of fire.—The story begins with the fire of volcanoes and lightning and the carrying of firebrands from the sources for rekindling,

illustrated by means of colored drawings; it is continued in a series of exhibits showing progressive steps in the making of fire, illustrated by rubbing sticks, revolving drills, flint and steel, the lucifer match, and devices for producing the electric spark.

Illumination.—Two series of objects are chosen, the first illustrating the torch in its many forms, arranged progressively; the second, the lamp, beginning with the stone cup with oil and wick and ending with the argand burner and the arc light.

Fishing.—Of the various exploitative activities, so necessary to the sustenance of the race, only one group—the art of fishing—is represented, others having been omitted for want of space. Series 1 illustrates the dart in its multiplicity of forms; series 2, the various toggle devices; series 3, the hook; series 4, the sinker.

Domestic arts.—Household arts are represented by four series—one epitomizing the history of cooking, and three illustrating utensils and devices employed in eating and drinking (the cup, the spoon, and the knife and fork).

Tools of general use.—The history of the more essential tools of human handicraft is epitomized in seven series, each beginning with the simplest forms—mere splinters and masses of stone—and ending with the highest forms, the marvelous machine-operated tools of to-day. They are the hammer, the ax, the adz, the knife, the saw, the drill, and the scraper.

Weapons.—Weapons of war have performed a most important part in the history of progress, and the steps that led up from the stone and the club held in the hand to the steel sword and compound machine gun are strikingly suggested in two series presented: 1, weapons for use in the hand—piercing and slashing weapons; and 2, projectile weapons—the bow and arrow, the crossbow, the pistol and gun.

Transportation, marine.—The history of water transportation is epitomized in four of its leading lines of elaboration: 1, the hull, beginning with the log raft and ending with the magnificent substructure of the modern ship (represented by models); 2, hand propulsion—the pole, the paddle and the oar (in part models); 3, the paddle wheel (models); and 4, the screw propeller (models).

Transportation, land.—Land transportation is shown in six series (models): 1, the burden bearer, man and beast; 2, the sliding load; 3, the rolling load; 4, the wheeled vehicle; 5, the steam locomotive; and 6, the railway track.

The great group of elaborative activities concerned in manufacture is illustrated in four exhibits: The ceramic art, the textile art, metal work, and sculpture.

Ceramic art.—In this exhibit are included four series: 1, implements and devices employed in manufacture—modeling tools, decorating tools, stamps, molds, and the throwing wheel; 2, the vase, showing progressive steps in shaping, decorating, and the results of firing on

the paste and surface finish; 3, glass making in its relation to ceramics; and 4, enamel.

Textile art.—Weaving is represented by three series: 1, the spindle; 2, the shuttle; and 3, the loom; the latter illustrating in a remarkable manner the rapid transition from primitive to highly developed appliances.

Metal working.—The history of this important branch is partially presented in three series: 1, metal reduction; 2, products of manufacture, showing progressive order in processes, forms, and embellishments; and 3, tools and appliances of manufacture.

Sculpture.—The stone-shaping arts begin with the simplest known artificial modifications of natural forms and advance to the achievement of the highest ideals as represented in Greek art. Four series are shown: 1, prehistoric stone shaping (Europe); 2, aboriginal American sculpture; 3, sculpture of civilized nations; and 4, implements used in stone shaping. Series 1, 2, and 3 are separated for the purpose of contrasting the work of distinct periods and peoples.

Photography.—This art, the product of advanced culture, is represented by three series of objects, epitomizing the development of: 1, the camera; 2, the lens; and 3, the picture.

The book.—A limited series of objects is devoted to the history of the book, the method of assembling the several parts—the tablets and sheets—being the feature considered.

Electricity.—Electrical inventions, representing one of the youngest and most marvelous branches of human activity, are shown in three limited series—1, experimental apparatus (Henry); 2, transmitting apparatus (Morse and subsequent inventors); and 3, recording apparatus.

Music.—Four series are devoted to the history of as many varieties of musical instruments—1, wind instruments; 2, reed instruments; 3, stringed instruments; and 4, percussion instruments.

The system of arranging these series is such as to make them fully intelligible to the average museum or exposition visitor. A large label or sign is framed and placed outside of each case at the top; a general label for each exhibit, giving briefly the history of the subject treated, is framed and placed inside the case. Also a label explaining each progressive series is placed at the beginning of the series, and individual labels describing the specimens are placed with the specimens.

Associated with these developmental series are a number of life-size figures, modeled in plaster and appropriately costumed, intended to illustrate the practice of the arts in their primitive stages. They give a vivid impression of primitive processes and serve to contrast these with the methods and machinery of advanced civilization. The subjects presented are as follows:

The fire maker.—A Ute Indian making fire by twirling, between the palms of his hands, a wooden shaft with its point set into a second piece of wood.

The flint flaker.—A Powhatan Indian roughing out stone implements from quartzite boulders.

The hominy huller.—A southern Indian woman pounding corn in a wooden mortar. Figure in plaster, with costumes restored from drawings made by members of the Virginia colonies.

The skin dresser.—A Sioux woman using a scraping or graining tool in preparing a buffalo robe.

The potter.—A Papago Indian woman modeling an earthen vessel.

The metal worker.—A Navajo Indian making silver ornaments. Processes probably introduced, in part, at least, by whites.

The belt weaver.—A Zuñi girl, with primitive loom, weaving a belt.

REPORT ON THE DEPARTMENT OF BIOLOGY FOR THE YEAR 1897-98.

By FREDERICK W. TRUE,
Head Curator.

The Department of Biology was established at the opening of the fiscal year, July 1, 1897, by bringing together under a separate administrative head the several zoological divisions already existing in the Museum, and the Division of Plants. The collections represented by these various divisions together constitute the larger part of the Museum, and have been accumulating for nearly half a century. The majority of the divisions themselves have been in existence since the reorganization of the Museum, in 1881, and several of them for a much longer period.

On account of the great length of time that the collections have been in existence, and the well defined and long-established methods of systematic zoology and botany, no radical changes in the mode of conducting the administrative or scientific business of the divisions has been necessary or in contemplation. The efforts of the head curator in the past year have been, as they probably will be in the future, largely in the direction of developing those features which in the past, for various causes, have not had due prominence.

The conditions prevailing as regards space and amount of assistance are far from ideal, and until much increased facilities in these directions have been provided it seems improbable that any great general advance can be made.

On the side of the exhibition of collections (the matter which appeals most directly to the public) the deficiency is in the nature of insufficient and unsuitable space. Without a rearrangement which would involve both of the other departments of the Museum and an amount of work incommensurate with the result obtained, the proper sequence of exhibition collections can not be had in the present quarters.

At the close of the last year the birds, reptiles, fishes, and mollusks and other invertebrates, except insects, were displayed in the Smithsonian building, while the mammals, insects, and collections representing comparative anatomy were displayed in the Museum building. As any general transfer of the birds is impracticable at the present time, endeavor was made to at least somewhat improve the sequence by removing the insects to the Smithsonian building and transferring the exhibits of batrachians, reptiles, and fishes to the Museum building. This was accomplished without a great amount of labor or expense,

and is a gain to the extent of bringing all the exhibits of invertebrates together in the Smithsonian building.

The erection of galleries in the Museum building, while it did not involve as much rearrangement in this department as in those of anthropology and geology, nevertheless made a complete reinstallation of the large exhibition series of mammals unavoidable.

This change brought to view the desirability of having the zoological collections, for the most part at least, arranged in accordance with some one comprehensive plan. While many schemes of more or less merit suggested themselves, the limitations as regards the extent and character of the space at command were such as to preclude most of them; while the anticipation that a new building may be provided at no very distant time in the future, made the adoption of others seem undesirable. After giving the matter serious thought, I decided that the zoological exhibits should be arranged on a faunal basis, special prominence being given to the faunas of the United States. This principal series is to be supplemented by various smaller special series, illustrating important topics in biology. The adoption of this plan, it is believed, will cause the exhibits to be more significant and more attractive to the public than hitherto, and at the same time the labor and expense involved in effecting the modification will be limited.

A good start in this direction has been made during the past year in connection with the mammals, batrachians, reptiles, and fishes. The greatest change, as already stated, was made necessary in the Division of Mammals on account of the erection of galleries in the south hall of the Museum building, in which the exhibits are placed. The cases containing groups of large mammals could no longer stand in the center of the hall, and were therefore arranged at the sides under the galleries. The main floor is now devoted to an American faunal collection, and the galleries to the faunas of the rest of the world. It is the intention to make the North American series complete, but other faunas can only be represented by genera, even if it were desirable to do so, on account of lack of space. The old wall cases were removed to the gallery, and it is the intention to add to them at the beginning of the next fiscal year, so that they will occupy the whole of the wall surface on both sides of the gallery. Floor cases along the railings will be employed for the smaller species.

The American batrachians, reptiles, and fishes were brought together in the southeast range. At the close of the year the cases in the Smithsonian building containing marine invertebrates were rearranged, but a complete reinstallation of the specimens and a modification of a majority of the cases will be needed. The cases containing exhibits of insects were removed, as already stated, to the Smithsonian building, but no work has as yet been done on them. No extensive change is at present in contemplation in connection with the exhibits of birds, mollusks, or comparative anatomy.

Hitherto the Museum has had no botanical exhibition series, except a small collection of specimens of native and foreign woods, pictures of trees, etc., intended to illustrate the subject of forestry. This collection was withdrawn from exhibition some years ago. To form a really significant botanical exhibit it is recognized that it will be necessary to begin *de novo*. Any advance in this direction is hedged about by difficulties because of insufficient space. A beginning has, however, been made by mounting under glass a representative series of seaweeds. To these it is the intention to add outline series representing other groups of plants, and to supplement these by special exhibits, such as illustrations of poisonous plants, models of poisonous and edible fungi, etc. The plans for these are, however, subject to modification in the coming months, and it is even possible that the construction of galleries in the ranges, and in particular in the southeast range, for which provision was made by Congress, will prevent any further installation of exhibition collections during the coming year.

The additions to the zoological and botanical collections during the year have been very numerous, and in some directions unusually important. First should be mentioned the donation by Messrs. Henry G. Hubbard and E. A. Schwarz of their collection of Coleoptera, principally North American, comprising about 200,000 specimens, and representing approximately, 12,000 species. The addition of this great and important collection places the National Museum in advance of all others as regards North American Coleoptera, and the generosity of the donors in presenting this vast amount of material, which they have accumulated with so much labor and expense, can not be too highly extolled.

The labors of Dr. W. L. Abbott, who for so many years has been a most generous benefactor of the Museum, demand liberal commendation. During the past year this indefatigable collector presented to the Museum large collections of birds, mammals, reptiles, insects, and other animals from Lower Siam and Kashmir. The Abbott collection comprises the larger portion of the most valuable Old World material of the Museum. Dr. W. L. Ralph has continued his valuable gratuitous additions to the collection of birds' eggs, and in this connection should also be mentioned the gift of Prof. Dean C. Worcester, of Ann Arbor, Michigan, comprising more than 600 bird skins, 900 eggs, and 250 birds' nests from the Philippine Islands. The friendly cooperation of Dr. L. T. Chamberlain has resulted in large additions to the collection of fresh-water mussels. The largest acquisition of the year in this direction was the gift of Dr. R. Ellsworth Call, of Cincinnati, comprising over 86,000 specimens. Mr. Outram Bangs, of Boston, Massachusetts, presented a very interesting series of bird skins, 170 in number, from Santa Marta, Colombia.

The additions to the herbarium for the year exceed 40,000 specimens, of which about one-half were obtained by purchase. Gifts of plants

have been numerous and amount together to about 4,000 specimens. Prof. O. F. Cook presented 662 specimens of Liberian plants in excellent condition and of much interest. Dr. B. L. Robinson, of Cambridge, Massachusetts, presented a large series of valuable Mexican plants, numbering in all about 1,700 specimens. These were admirably supplemented by another collection of Mexican plants presented by Mr. E. A. Goldman, of Alila, California. About 6,000 plants were acquired by exchange during the year.

As already stated, about 20,000 herbarium specimens were purchased. Every important American collection offered for sale was obtained, with the result that the National Herbarium has been greatly enriched.

The scientific bureaus of the Government, particularly the U. S. Fish Commission and the Biological Survey and Division of Botany of the Department of Agriculture, have continued to make very valuable additions to the national collections. Especially to be mentioned are the invertebrates collected by the naturalists of the *Albatross*, in 1896, on the coasts of California, Japan, and Kamchatka, and in Bering Sea, and the specimens obtained by the assistants of the Commission during the past thirteen years, comprising more than 600 lots. Numerous valuable types and cotypes of different species of fishes collected by the Commission have also been transmitted. The Biological Survey collected in Mexico a large series of land shells, which are regarded by Mr. Dall, the curator of the Division of Mollusks, as the most intrinsically valuable acquisition of the year in that direction. Mr. Dall remarks:

This series, collected at various times and localities, contains an unusual number of fine undescribed species and numerous others new to the collection. The proportion which may be described as really valuable is unusually large.

The accumulation of valuable specimens received singly or in small lots from numerous friends of the Museum deserves notice. An enumeration of these will be found in Appendix II.

With the exception of plants, few purchases of importance were made for the Department during the year, but a series of rodents from Patagonia, collected by Mr. W. A. Peterson, comprising 239 specimens is deserving of notice. The collection of mammals is very deficient in South American specimens, and this material was especially desirable.

An extended reference to the explorations of members of the Museum staff will be found on page 69. Collections were made by Messrs. Rose and Pollard in Mexico and Florida, respectively; by Dr. Leonard Stejneger in the vicinity of the Commander Islands; by Messrs. Schuchert and White on the coast of Greenland, and by Mr. Robert Ridgway in Florida. The explorations of Mr. R. P. Currie in Liberia were referred to in the last Annual Report, although the larger portion of the material obtained was not received until after the beginning of the present fiscal year.

Some important changes were made in the personnel of the department during the year. In the Division of Insects, Dr. Harrison G. Dyar was appointed custodian of Lepidoptera. Dr. William L. Ralph succeeds the late Maj. Charles Bendire as custodian of the Section of Birds' Eggs. Mr. W. T. Swingle was appointed custodian of the Section of Algæ and Mr. D. G. Fairchild of the Section of Lower Fungi. These gentlemen have rendered exceedingly valuable services in their several sections during the year. The department is indeed dependent for its successful operation at the present time very largely upon the gratuitous, disinterested efforts of its honorary curators and custodians, the value of whose services can not be overestimated.

In the Division of Marine Invertebrates Miss Harriet Richardson and Miss Mary B. Smith served as volunteer assistants.

The routine work of entering, classifying, and caring for the collections in the several divisions has been carried on continuously, and it may be said that the condition of the collections in general is better than ever before. The greatest drawback has been found in the lack of sufficient laboratory space, the working rooms in some of the divisions being crowded to such an extent that it is almost impossible for the assistants to move about in them. This crowding affects the work in many ways, making the arrangement of collections unavoidably unsystematic, to a large extent, and rendering nearly impossible those operations which require the use or inspection of large numbers of specimens at the same time. The extensive collection of mammals of the Department of Agriculture, including especially the large forms, were brought together in a part of the southeast range, which has been screened off for the purpose, no other space being found for this bulky material. This encroachment upon the exhibition space is considered undesirable, but can not be avoided unless additions are made to the Museum building or a larger structure provided. A similar provision was made for the National Herbarium, in the Division of Plants, a portion of the East Hall gallery being given up for the purpose. The collection of plants has grown to great size and importance and has entirely overflowed the quarters assigned to it a few years since.

In the Division of Mammals the type specimens were brought together and carefully labeled with special red tags where needed. They will be kept hereafter in special cases. The overcrowding in the upper laboratory was somewhat relieved by a rearrangement of specimens, but the case room is at present inadequate. The study series is in an excellent state of preservation, but much in need of a rearrangement, which, however, can not be accomplished until more case room is provided.

In the Division of Birds Mr. Robert Bidgway, curator, reports that a large portion of the series, including all the water birds and waders, was thoroughly overhauled and rearranged in new dust-tight cases, which have been provided for the purpose. Some twenty families still

require attention, and are now, for the most part, crowded into cases which are unsuitable and are practically inaccessible. A special effort has been made during the year to bring together type specimens of birds and to see that they were properly labeled and arranged in cases made for the purpose.

Doctor Ralph devoted a large amount of time to clearing away the accumulation of work in the Section of Birds' Eggs since the death of Major Bendire. The collection now numbers over 64,000 specimens, and is by far the most extensive in existence. While the eggs themselves are in excellent condition, the collection of nests is only indifferently provided for, and new cases will be needed.

As is fully recognized by the curator, the exhibition series of birds is by no means satisfactory. The cases in the Smithsonian building are old and not dust tight, and are furthermore very much crowded together, on which account, and because of the insufficient lighting in the hall, the collection can not be appreciated at its true value. As already stated in another part of the report, an attempt will probably be made during the coming year to remedy these defects to a certain extent, but the problem is a very difficult one, and it is doubtful whether the exhibit can be brought up entirely to modern standards without more expense than would be justified under present conditions. Special attention was given to some of the series, such as the hornbills, a very striking group, of which the Museum possesses a full collection. This series was entirely overhauled and new forms added.

A special series arranged for children has been for some time exhibited in a small room adjacent to the main hall, and was relabeled throughout during the year.

In the Division of Reptiles and Batrachians, the exhibition series was removed from the Smithsonian to the Museum building, as already stated, and rearranged to form a faunal North American series. The exotic mounted skins, which were indifferent in quality and insufficient in number and variety to form a series of any significance, were boxed and stored, duplicates of American species were removed, and the remainder arranged in systematic order. The curator, Dr. Leonhard Stejneger, reports the general collections as being in excellent condition, but no extensive operations were carried on, as he was necessarily absent a considerable portion of the year in connection with his duties as a member of the Fur Seal Commission.

The exhibit of the Division of Fishes at the close of the last fiscal year consisted of several cases of casts and a large number of alcoholic specimens in jars, all of which were displayed in one of the smaller halls in the Smithsonian building. For reasons previously stated, the casts were removed to the Museum building, where they were installed in the southeast range in cases more suitable, and in such manner that the characteristics of the American fauna could be appreciated at a glance. The large collection of alcoholics was withdrawn from exhibi-

tion, it having been shown that they could scarcely be made interesting or instructive to the public. A place was found for them in the laboratory, which for some time had been occupied by mammals, a change which has the advantage of allowing them to be protected from the light and make them accessible to students without intruding upon the public. Type specimens were placed in special cases and guarded from the light, which causes deterioration.

The cases formerly used for the exhibition of fishes being old and of a pattern not now considered suitable for such purposes, they were removed to the laboratory and there made use of for the better arrangement of the general study series.

Mr. William H. Dall, curator of the Division of Mollusks, reports the great collections of that division in good condition, but calls attention to the inconvenience arising from overcrowding, which increases year by year. A very large amount of material, comprising no less than 3,500 species of shells, was identified for correspondents of the Museum during the year. In connection with this work, however, the Museum receives many valuable specimens.

There has been very great activity in the Division of Insects during the year, which the honorary curator, Dr. L. O. Howard, regards as a phenomenal one in the history of the division. He writes:

The surprising part, however, is in the fact that the actual number of species and specimens and their scientific value surpasses anything in the history of the division, since, notwithstanding the wonderful increase and value of the specimens received last year, due to the extensive exotic material presented by Dr. W. L. Abbott, those received during the present year will more than equal those received during the past decade. This increase is due principally to the very large and valuable collection of North American Coleoptera presented by Messrs. Hubbard and Schwarz, while it is worthy of note that the additions, without this collection would be nearly three times as large as those in the previous fiscal year.

The collections are in a better state of preservation than ever before, and a large amount of work has been done in rearranging and classifying specimens. The material in each order has been divided according to continents and arranged systematically, by which plan the labor of identifying new material is considerably lessened. Dr. Dyar, custodian of Lepidoptera, has rearranged the collections of that order, adding many species from his private collection, and in both ways very greatly increasing the value of the collections. This voluntary work is of much importance to the Museum and is highly appreciated. All the types and cotypes at present in the collection have been properly labeled during the year and recorded in a special catalogue. The whole number of these specimens is nearly 6,000.

The chief operation of the Division of Marine Invertebrates was the preparation of 100 sets of duplicate specimens, designed for distribution to high schools throughout the country. Each set contains specimens representative of about 100 species, and more than 30,000 specimens are included in the entire series. About one-half of these

sets have already been distributed. The distribution of this large amount of material has relieved the storerooms and cases. As already stated, a considerable change is contemplated in the exhibition series of the division, and at the close of the year work was begun by a readjustment of the the cases in the exhibition hall.

The curator of the Division of Comparative Anatomy, Mr. F. A. Lucas, was absent a considerable portion of the year in connection with his duties as a member of the Fur Seal Commission. On that account, and because he is also charged with the general care of the vertebrate fossils, a large amount of work has not been done on the osteological collections. So far as the exhibition series is concerned this is not detrimental to the Museum, as the series is already very full and very carefully arranged and labeled. The condition of the reserve series, however, is not satisfactory, the curator reporting that more than double the number of drawers now in use are needed for the accommodation of specimens and their proper arrangement and to permit the withdrawal from storage of the large amount of material now practically inaccessible.

In the Division of Plants Mr. F. V. Coville, honorary curator, reports that several important changes and improvements have taken place.

In order to provide a circulation aisle for visitors around the East Hall gallery it was necessary to move the screen at the east end back some 4 feet into the botanical laboratory. The loss of space was compensated for by assembling a double row of cases on the south side of the gallery for its whole length, making in all about 200 running feet. Whether this arrangement can be maintained permanently is perhaps doubtful.

Two rooms in the east tower were fitted up for the collection of cryptogamic plants, which, however, is likely to soon outgrow these quarters.

The sectional herbarium, numbering some 30,000 specimens, which was formerly kept in the Section of Paleobotany, was returned to the general collection, and the work of distributing the specimens to their proper places has progressed satisfactorily during the year.

The separation and marking of type specimens has been continued. During the year 252 such specimens were marked, making a total thus far of 1,596.

Scientific investigations of more or less wide scope have been carried on in the several divisions of the department during the year, and the results obtained are very creditable to the staff. Mr. Robert Ridgway has made satisfactory progress on the comprehensive manual of North and Middle American birds, which he has had in preparation for a considerable time. The head curator of the department has continued studies on the cetaceans, and has completed a paper on the nomenclature of the whalebone whales of the North Atlantic. Mr. G. S. Miller, jr., has been engaged in an investigation of the Free-tailed bats.

He has published several minor papers on mammals during the year. Dr. T. H. Bean has continued work on the collections of fishes made by the Fish Commission steamer *Albatross* in South American waters, and has made investigations in the waters of New York with special reference to fish life. Mr. Barton A. Bean has continued investigations on the collections of Mexican fishes and has completed one portion of the work, the results of which are now in hand for publication. He also made a study of the fishes of Wallowa Lake, Oregon, for the U. S. Fish Commission, the results of which are given in a report already in the hands of the Commissioner. Mr. W. H. Dall has devoted considerable time to a revision of the bivalve shells in connection with his work on the Tertiary invertebrate fauna, and has made various minor investigations. The study of the fresh-water mussels has been continued by Mr. C. H. Simpson with important results. Dr. L. O. Howard has continued studies on the parasitic insects of the family Encyrtinæ, especially those parasitic on the Coccidæ, and has completed one paper on that group. Mr. W. H. Ashmead has nearly completed his monograph of the insects of the family Braconidæ, which he has had in hand for several years, and has worked up four large collections of Hymenoptera. The collections of insects made by Messrs. Stejneger and Barrett-Hamilton, of the Fur Seal Commission, on the Commander Islands, have been worked up and reported upon by Messrs. Schwarz, Dyar, Coquillett, Banks, and Cook. The results will be published in the report of the Fur Seal Commission. Mr. Coquillett completed his monograph of the flies of the family Tachinidæ and his revision of the Simuliidæ, and both have been published. He also worked up the Japanese Diptera, received from Professor Mitsukuri, and completed a revision of the family Scatophagidæ. He has under hand revisions of the Helomyzidæ and Sapromyzidæ. Prof. O. F. Cook has continued studies on the Myriapoda and the Orthopteran insects of the families Mantidæ and Phasmidæ. Mr. J. E. Benedict has completed his studies of several groups of Isopod Crustaceans and published reports on the Arcturidæ and the genera *Synidotea* and *Idotea*. He has continued work on the Galatheidæ and has in preparation a paper on the genus *Munidopsis*. Miss M. J. Rathbun completed a paper on the Decapod Crustaceans of Jamaica and on the Brachyuran Crustacea collected by the Iowa University expedition of 1893 to the Florida Keys and Bahamas. She also completed three minor papers on Crustaceans and made other studies in that group.

Mr. J. N. Rose, assistant curator in the Division of Plants, has devoted a considerable portion of the year to the determination of the botanical material collected by him in Mexico, with a view to the publication of the results of his observations.

The collections of the department have been made use of extensively by naturalists throughout the country and abroad, various series and single specimens being loaned, as in previous years, for investigation.

(For a detailed list of loans see page 64.) The loans of botanical material have been very numerous, aggregating in all about 3,900 specimens. Included in the records of loans are the names of the botanical departments of Columbia, Cornell, and Harvard universities and other universities and colleges, together with botanical gardens and museums at home and abroad. In addition to these loans of specimens the collections have been studied in Washington by numerous specialists during the year. The naturalists of the U. S. Fish Commission and of the Biological Survey and other bureaus of the Department of Agriculture have of course had free access to the collections, and have made use of them to a considerable extent.

The publications for the year (a list of which will be found in the Bibliography) show a gratifying activity on the part of the scientific staff of the department, and indicate also the large extent to which the collections are being used by naturalists generally.

Considerable time was occupied during the year in preparations for an exhibit at the Trans-Mississippi and International Exposition, at Omaha, Nebraska. The exhibit which was planned by the head curator, and assembled with great success by the heads of the several divisions, consists of a representation of the aquatic faunas and marine plants of the United States. Every group of animals inhabiting our waters is included, from the lowest to the highest, and an extensive and most excellent series of seaweeds. The large mounted birds and the casts of fishes and reptiles are displayed in a large wall case constructed for the purpose. The remainder of the exhibit is shown in narrow floor cases, with full plate-glass fronts. It includes some novelties, such as jelly fish preserved in formalin, which have probably not been seen at any previous exposition. The whole series is carefully labeled.

REPORT ON THE DEPARTMENT OF GEOLOGY FOR THE YEAR 1897-98.

By GEORGE P. MERRILL,
Head Curator.

The past year has been one of great, if not unparalleled, progress in the department. This for the reason that under the reorganization which was effected early in the year, proper coordination of the various divisions was for the first time rendered possible.

Owing to the suspension of work of all kinds in the exhibition halls during the construction of the new galleries and exhibition cases, together with the prolonged absence of the head curator in Europe, it is true, however, that but little of this progress is as yet evident to the public.

Since actively assuming charge of the department, early in November, the head curator has devoted much time to going over the written and printed records of the various United States exploring expeditions and surveys with a view to ascertaining what geological materials had been collected which could be properly considered the property of the Government, and what disposition had been made of the same. This has resulted in bringing together some of the scattered materials which had been loaned in years past for study purposes, or which had never been turned over to the custody of the Museum. Moreover, so soon as it became apparent that the department was ready and more than willing to take charge of the materials, Prof. O. C. Marsh announced his readiness to turn over the large series of vertebrate fossils collected under his direction during his connection with the U. S. Geological Survey under J. W. Powell. Mr. Lucas, the acting assistant curator of the Division of Vertebrate Paleontology, spent four weeks, with proper assistance, at New Haven in May and June of this year, with the result that two carloads of these fossils, comprising many specimens of *Triceratops*, besides *Dinoceras*, *Elotherium*, and other Miocene forms, have already been received.

Arrangements have been made, through the administrator of the estate of the late E. D. Cope, for the return to the Museum of the extensive series of Eocene fishes, collected principally during the years 1872-73 in Utah and Wyoming, and retained by Professor Cope for study. It is confidently expected that these will reach the Museum even before this report appears in print.

In addition to the collection of vertebrate fossils already noted, the division has obtained, through purchase, a valuable collection of Mosa-

saur from the Cretaceous of western Kansas, two collections of Elasmobranch teeth and spines from the Carboniferous of Iowa, and an unusually fine skull and fore-limb bones of *Claosaurus*.

Through the U. S. Geological Survey was obtained a small collection of vertebrates, including a new species of *Dinictis* and a *Suilline* from the Miocene of Dakota.

The Section of Invertebrate Paleontology has likewise been greatly enriched, the two most important accessions being gifts. Through the bequest of the late Mr. I. H. Harris the Museum has come into the possession of his private collection of over 20,000 specimens of fossils. This is one of the finest collections ever made from the rocks of the Cincinnati group, and is particularly rich in starfishes, crinoids, and trilobites, and, moreover, contains a number of original types.

Mr. R. D. Lacoe, of Pittston, Pennsylvania, to whom the Museum is already so largely indebted, has presented his extensive collection of fossil insects. This comprises upwards of 4,640 specimens, of which more than 200 are types. In addition, he also presented 97 other invertebrate fossils, 408 vertebrate fossils, and added 132 specimens to his series of fossil plants. From the U. S. Geological Survey was received a series of over 600 specimens of Kinderhook crinoids, corals, and mollusca, and 450 crinoids from the Burlington group in Iowa. In addition, Messrs. Schuchert and White, of the Museum and Survey, made a valuable collection representing the flora of the various Cretaceous and Tertiary horizons of North Greenland. Other valuable materials, including an excellent *Placentiaceras*, 22 inches in diameter, from Dakota, were obtained either by purchase or otherwise.

The Division of Mineralogy has materially benefited during the year through the acquisition of much new material, including several new and rare species.

The Division of Physical and Chemical Geology reports the acquisition of a large cluster of basaltic columns from near Bonn, Prussia; some large masses of a beautiful orbicular granite from Sweden; fulgurites on andesite from Little Ararat in Armenia, besides a large amount of petrographic material from the U. S. Geological Survey and other sources. The Economic Series have been enriched through the acquisition of some beautiful clear masses of rock salt from Heilbron, Prussia, collected by the head curator; kaolins and clays from Germany and Saxony; an excellent series of telluride ores from the Cripple Creek district, Colorado, and other materials which need not be mentioned in detail here.

Aside from what has been accomplished in the Division of Mineralogy, but little progress has been made in the work of installing the exhibition series. This is for the reason that the erection of the new galleries in the exhibition halls of the Divisions of Paleontology and Economic Geology, was not completed in season for more than a beginning to be made. Indeed, the new cases in the paleontological halls are not yet in readiness. Moreover, for a period of several weeks the energies of

nearly every curator and those of his assistants were fully occupied in the work of preparation for the Trans-Mississippi Exposition. The details of this work have been the subject of a special report, and need not be repeated here.

Mr. Lucas reports that in the Section of Vertebrate Paleontology a large amount of preparatory work has been done incidental to strengthening, restoring, and preparing for exhibition the skeleton of *Zeuglodon*. Two skulls of *Oreodon*, and one of *Mesohippus* from the Evans collection have been cleaned, a fine skull of *Claosaurus* and the upper portion of a magnificent *Triceratops* nearly prepared for exhibition, and smaller skulls and parts of skeletons wholly or partially prepared for exhibition or study. Work of this nature is extremely slow and laborious, and additional preparators are sadly needed. When it is remembered that, excepting when aided by Mr. Schuchert and others in the Section of Invertebrate Paleontology, the entire work of this division has thus far been carried on by Mr. Lucas, with the assistance of one clerk and one preparator, it will be recognized at once that surprising progress has been made.

The prolonged absence of Mr. Schuchert, incidental to the purchase of materials for the Trans-Mississippi Exposition, and a subsequent trip into Missouri, together with his Greenland trip earlier in the season, has necessarily greatly retarded his work. Satisfactory progress has been made in installing the study series and in the preparation of exhibition material, though this, too, is delayed, owing to the condition of cases and exhibition halls. Practically nothing has been accomplished with the paleobotanical series. It is expected that the appointment of an assistant in charge of this collection, and the completion of the galleries and cases, will enable me to report more satisfactory progress another year. Up to this time all Museum work done on these collections has been voluntary by members of the paleobotanical staff of the Geological Survey, or by Mr. Schuchert and his assistants, whose time was already more than occupied by the work of their own division.

In the Division of Mineralogy I have to report satisfactory progress in the installation of the exhibition series. The Systematic Series, the collection of meteorites, and several special series are now, for the first time, satisfactorily installed, and Mr. Tassin, who has had immediate charge of the work, is entitled to much credit, not merely for his energy and industry, but as well for the taste he has manifested in the selection and display of the material.

Much work yet remains to be done in the way of supplying deficiencies and labeling, but it is not too much to say that the collections as a whole are in excellent condition.

In the Division of Physical and Chemical Geology (systematic and applied) of which the head curator has immediate charge, no progress whatever has been made with the exhibition series until within a

period of some two weeks, owing to the delay in the completion of the gallery cases and Mr. Newhall's absence in Nashville and Omaha. The work is now progressing satisfactorily.

An immense amount of detailed work has been accomplished in overhauling and classifying collections stored in boxes and drawers, but much yet remains to be done.

Scarcely any investigations of note have been undertaken by any of the curators, owing to the pressure of other matters and the unsatisfactory condition of the exhibition halls. The head curator was himself absent in Europe during the first five months of the year, attendant upon the meetings and excursions of the Seventh International Geological Congress, and engaged in a study of European museums. Mr. Lucas has nearly completed his work on the Fossil Bison of North America, and Messrs. Charles Schuchert and David White have made a preliminary study of the fossils collected by them in Greenland during the summer of 1897. Their results are now in press.

With the exception of the collections made by Messrs. Schuchert and White in Greenland and the necessarily limited amount of material brought back by the head curator from Russia, scarcely anything has been done toward the enrichment of the collections through the direct efforts of Museum officials. The collections made by the U. S. Geological Survey and obtained by gift, purchase, and exchange have been already referred to.

f. The usual custom of loaning collections for study has been adhered to. Two small lots of vertebrate materials were loaned during the year, the one to Prof. H. F. Osborn, of New York, and the other to Dr. C. R. Eastman, of Cambridge. Dr. J. F. Whiteaves, of Ottawa, Canada, was in like manner loaned a collection of Hamilton fossils, and Dr. George H. Girty, of the U. S. Geological Survey, has had the loan of a collection of English Carboniferous pelecypods for comparison with American species. A collection of thin sections of roofing slates was loaned Prof. T. Nelson Dale, of Williamstown, Massachusetts, and the U. S. Geological Survey has on sundry occasions been granted the usual courtesies.

The condition of the laboratories and exhibition halls has been such as to afford little encouragement to students and investigators. Prof. O. P. Hay has studied the large Cretaceous fishes from Kansas, with a view to deciding certain points in the structure of the skull and vertebral column, and also to ascertain whether or not the genus *Portheus* is synonymous with *Xiphaetinas*. Several new points on the structure and affinities were ascertained and the conclusion reached that *Xiphaetinas* Leidy, was identical with *Portheus* Cope. Similar results were reached independently by Alban Stewart, of Lawrence, Kansas. Prof. Henry F. Osborn has likewise studied the type of such species of *Coryphodon* as are represented in the collections.

Aside from the studies of members of the U. S. Geological Survey,

no investigations of note have been carried on in the Museum by other than its officers, either in the sections of Invertebrate Paleontology or Paleobotany. In the Division of Physical and Chemical Geology, Mr. Thomas L. Watson, now of the State survey of Georgia, and Dr. E. C. E. Lord have each spent several months, the one conducting investigations relative to the weathering of basic eruptive rocks and the other working on the rocks collected by Dr. Edgar A. Mearns along the line of the Mexican Boundary Survey, and a series of eruptive rocks from Casco Bay, Maine.

The reasons already enumerated have necessarily cut down the number of papers that might otherwise have been published by the curators. Such as have appeared are sufficiently noted in the Bibliography.

The rapid accumulation of materials, and particularly large materials like vertebrate fossils, bids fair to tax to the utmost our resources for handling, preparation, and proper care. When it is recalled that the preparation of a single skull may require the services of a skilled preparator for months, it will be seen at once that our present force is quite inadequate. Moreover, work and storage rooms are pitifully cramped. When further, one recalls the strikingly interesting character of the display that is possible with this class of material, as well as its great value from a purely scientific standpoint, the desirability of pushing the work with all possible vigor becomes at once apparent, and I feel that I can not too strongly urge the granting of additional funds for the purpose.

The work of rearranging the collections in physical geology, involving the actual moving of upward of 100,000 specimens, labeling, numbering, and bringing the card catalogue up to date, will consume a very large portion of the coming year.

The same may be said regarding work in the sections of Invertebrate Paleontology and Paleobotany. There are at present not far from 1,000 boxes of fossil materials of all kinds in storage, which must be overhauled, identified, duplicates assorted for exchange and distribution, worthless portions rejected, and the remainder made available for study and exhibition.

The amount of detailed labor essential to the proper care of the collections can be appreciated only by those who have had experience. This applies to other departments than my own.

Notwithstanding the fact that we are for the time being overburdened with materials, no opportunity should be lost for securing more, even though the same may remain years in storage. It is too much to expect that the present favorable conditions for collecting will always exist. Every reported discovery of interesting material, by members of the U. S. Geological Survey, or other parties, should be investigated, and where the character of the material warrants, immediate steps should be taken toward its procurement by purchase or otherwise. It must be borne always in mind that delays in these matters

result disastrously. This is particularly true regarding vertebrate remains which, once exposed, become quickly ruined, unless promptly and properly cared for, and inexperienced collectors often do more harm than good. Moreover, other institutions, both American and foreign, are ever on the alert to obtain that to which we naturally feel the National Museum is best entitled.

I can not refrain, in conclusion, from stating that too much praise can scarcely be awarded the individual curators and their assistants for the untiring energy and patience manifested, and their willingness always to lay aside individual desires and preferences for the welfare of the department as a whole. But for this, the work of the head curator would be disheartening in the extreme.

SUMMARY OF THE OPERATIONS OF THE YEAR.

THE MUSEUM STAFF.

On July 1, 1897, Mr. W. H. Holmes, Dr. Frederick W. True, and Dr. George P. Merrill were appointed head curators of the newly organized departments of Anthropology, Biology, and Geology, respectively. Mr. W. H. Holmes, who had been connected with the Field Columbian Museum in Chicago, assumed his duties at the National Museum on October 1.

Mr. William H. Ashmead, of the Department of Agriculture, was appointed assistant curator of the Division of Insects in the National Museum on July 1, and Mr. Gerrit S. Miller, jr., was given a temporary appointment as assistant curator of the Division of Mammals.

Dr. W. L. Ralph, of Utica, New York, was made honorary custodian of the Section of Birds' Eggs on November 12.

Mr. W. T. Swingle and Mr. D. G. Fairchild, both of the Department of Agriculture, were appointed custodians of the Sections of Algæ and Lower Fungi, respectively, in the Division of Plants. These appointments took effect December 7.

Dr. Harrison G. Dyar was appointed custodian of the Section of Lepidoptera, Division of Insects, on November 12.

On April 30 Dr. J. Walter Fewkes was appointed a collaborator in the Division of Ethnology.

Dr. F. W. True was appointed Representative of the Smithsonian Institution and National Museum for the Trans-Mississippi and International Exposition (Omaha), and Mr. M. V. Cox, chief special agent.

In the absence of Mr. W. V. Cox, Mr. J. L. Willige continued to act as chief clerk.

A complete list of the members of the scientific and administrative staff is given in Appendix I.

APPROPRIATIONS AND EXPENDITURES.

The amount appropriated for the National Museum for the current fiscal year was \$233,000. The total expenditures under this appropriation aggregated \$227,473.54, leaving a gross balance of \$5,526.46. From the appropriations for the previous fiscal year expenditures to the amount of \$10,492.95 were made, leaving a balance (subject to liabilities) of \$391.76.

The appropriations for the fiscal year just ended were \$25,275 in excess of those for the preceding year, there being an increase of \$6,775 in the amount appropriated for the preservation of collections, an increase of \$1,000 for heating and lighting, an increase of \$15,000 in the amount allotted for furniture and fixtures (to be used for the construction of cases, etc., for the new galleries), and an appropriation of \$2,500 for removing and rebuilding storage sheds. It may be remarked that the amount allotted for the preservation of collections fell short of the estimate to the extent of \$20,000, and that the appropriation for heating and lighting was \$1,000 below the estimate; also that the sum asked for to be used in repairs to buildings was cut down one-half, the amount provided being only \$4,000. The sum of \$18,000 was requested for printing and binding, but only \$12,000 was appropriated.

The following tables show the expenditures from the various appropriations during the year and the amounts on hand June 30, 1898.

Appropriations and expenditures for the fiscal year ending June 30, 1898.

Object.	Appropriations.	Expenditures.	Balance on hand June 30, 1898.
Preservation of collections	\$160,000.00	\$157,636.49	\$2,363.51
Furniture and fixtures	30,000.00	28,289.54	1,710.46
Heating, lighting, and electrical service	14,000.00	13,183.13	816.87
Postage	500.00	500.00	.....
Building repairs	4,000.00	3,968.02	31.98
Rent of workshops	2,000.00	1,999.92	.08
Galleries	8,000.00	7,448.13	551.87
Rebuilding sheds	2,500.00	2,471.10	28.90
Printing	12,000.00	11,977.21	22.79
Total	233,000.00	227,473.54	5,526.46

Disbursements from unexpended balances of appropriations for the fiscal year ending June 30, 1897.

Object.	Balance June 30, 1897.	Expenditures.	Balance June 30, 1898.
Preservation of collections	\$4,201.93	\$3,821.94	\$379.99
Furniture and fixtures	1,801.07	1,792.77	8.30
Heating and lighting	742.11	739.27	2.84
Building repairs	115.25	114.67	.58
Galleries	4,024.85	4,024.30	.55
Total	10,884.71	10,492.95	391.76

The unexpended balances of appropriations for the fiscal year 1895-96 remain the same as at the close of the last fiscal year, and are as follows: Preservation of collections, \$1.32; furniture and fixtures, \$0.20; heating and lighting, \$0.42; building repairs, \$1.38. No further claims having been presented against these appropriations, the balances will revert into the Treasury, to be carried to the credit of the surplus fund, under the provisions of section 3090 of the Revised Statutes.

The following statement concerning the estimates for appropriations for the fiscal year ending June 30, 1899, is quoted from the report of the acting chief clerk, Mr. J. L. Willige:

In October estimates were prepared of the appropriations required for the maintenance of the National Museum during the fiscal year ending June 30, 1899. In addition to the regular appropriations for furniture and fixtures, heating and lighting, preservation and increase of collections, building repairs, rent of workshops, postage, and printing and binding, the following special appropriations were requested: For illustrations for Museum publications, \$5,000; for the purchase of books, pamphlets, and periodicals for reference, \$2,000; for the continuation of the construction of galleries in the Museum building, the building of skylights in the four courts, and the erection of a ventilator upon the roof of the lecture hall, \$10,000; for the erection of a fireproof building for workshop and storage purposes, \$50,000; for the purchase of the herbarium of the late M. S. Bebb, of Rockford, Illinois, \$5,000; for the purchase of the library of the late G. Brown Goode, \$5,000.

An increase of \$20,000 was requested in the estimates for the coming fiscal year for the preservation, exhibition, and increase of the Museum collections. The importance of the grant of this additional sum for the purpose of developing the Department of Geology and expanding it in the direction of a museum of practical geology and to enable substantial increases to be made in the compensation of the higher grades of assistants in the Museum was strongly urged upon Congress.

The latest conference report on the sundry civil bill states the item at \$165,000, an increase of \$5,000 over the appropriation for 1898.

In the estimates for appropriations for the coming fiscal year is an item of \$15,000 for heating and lighting, being \$1,000 in excess of the current appropriation.

In view of the considerable sum of money paid from year to year by the Museum for the preparation of drawings for use in the Museum publications, it was endeavored to have a specific appropriation of \$5,000 provided for the purpose. It was explained that this item of expenditure is an important one in carrying out the policy of disseminating information regarding the Government collections among educational institutions throughout the country, and the hope expressed that it would not be necessary to continue the cost of illustrations as a charge upon the appropriation for the preservation, exhibition, and increase of the Museum collections. The sundry civil bill, while not, however, containing a specific appropriation for drawings, authorizes the expenditure for this purpose, from the preservation of collections appropriation, of a sum not exceeding \$5,500.

In the estimates submitted to Congress for the coming fiscal year is an item of \$17,000 for printing the Bulletins and Proceedings and labels and blanks for the National Museum, and binding books and pamphlets for the Museum library. It is urged that the entire sum asked be appropriated, in order that an edition of the Museum publications large enough to supply the principal scientific and educational establishments may be assured.

The sundry civil bill had not become a law at the close of the fiscal year, but the appropriations for the year ending June 30, 1899, as agreed to by the conferees of the Senate and House of Representatives are as follows:¹

Furniture and fixtures (including \$20,000 for furnishing new galleries)	\$35, 000
Heating and lighting	14, 000
Preservation of collections	165, 000
Purchase of books of reference	2, 000
Building repairs	4, 000

¹ The sundry civil bill, as finally passed, carried the appropriations indicated.

Rent of workshops and storage quarters	\$4,500
Postage stamps	500
Galleries (including skylights and ventilator)	10,000
Purchase of Goode library	5,000
Printing and binding	17,000
Total.....	257,000

BUILDINGS.

In the acts of Congress approved June 11, 1896, and June 4, 1897, provision was made for the erection of iron galleries in the Museum building. Under these appropriations, amounting altogether to \$16,000, galleries have been erected in the four courts and in three of the halls of the building, thus increasing the exhibition space by 17,000 square feet.

During the fiscal year just closed the work of constructing the galleries has been under the direction of the Superintendent of the Library of Congress.

In the estimates submitted to Congress for appropriations for the coming fiscal year the sum of \$10,000 was asked for, to be used in erecting galleries connecting the courts with the adjoining halls, supplying railings, painting the ironwork about the galleries, and placing skylights above the courts. This item is included in the sundry civil bill as passed by both Houses of Congress and sent to the President for approval.

It was requested in the estimates for 1898-99 that provision be made for the construction of a special building adapted for workshops and for storage purposes. A preliminary plan for a building 50 feet front by 130 feet deep, to be entirely fireproof in its construction and corresponding in its materials and workmanship with the Museum building, was prepared and submitted. The cost of the proposed building was estimated at \$50,000. The Government reservation between the National and Army Medical museums, with frontage on B street south, was suggested as an advantageous site for the building. The proposition was not favorably acted upon by Congress, but, in addition to the \$2,000 customarily granted for the rental of a building for storage purposes, the sum of \$2,500 was appropriated for the rental of additional quarters in which to place the carpenter and cabinet shops and for the storage of the material contained in the wooden shops near the Fish Commission building.

The storage sheds south of the Smithsonian buildings were removed during the year. They had long been regarded as a source of danger to the main building in case of fire. Some sections of the sheds were removed to the yard of the storage building on Ninth street. The remaining serviceable material was used in the erection of a two-story workshop.

The wooden floors in two of the ranges were taken up and substantial concrete floors laid in their stead. Mahogany wall cases and

screens have been constructed and placed in position on several of the galleries.

In order to accommodate additional floor cases, the steam radiators in some of the exhibition halls have been raised to a convenient height and attached to the piers. Improvements in the water-supply system have also been made.

The walls in many of the halls and ranges and in two of the courts were painted during the year.

ACCESSIONS AND REGISTRATION.

The amount of material received during the year was unusually large, aggregating 457,096 specimens. These were embraced in 1,441 separate accession lots. In the division of insects alone 226,000 specimens were received, due to the acquisition of the Hubbard and Schwarz collection, which is specially referred to elsewhere. Large quantities of material were received by the Division of Mollusks and the Division of Paleontology, and there have been notable increases in the collections of the divisions of prehistoric archaeology, mammals, birds, and plants. The following tables show the number of specimens added to the various collections during the year and the total number of specimens in each collection on June 30, 1898:

Number of specimens received in 1897-98.

Anthropology:

Ethnology	14,528
Historic archæology	1
Prehistoric archæology	27,335
Technology	304
Graphic arts	328
Medicine	746
Religions	81
History and biography	1,366

Biology:

Mammals	5,762
Birds	8,211
Birds' eggs	1,545
Reptiles and batrachians	1,345
Fishes	600
Mollusks	91,657
Insects	226,236
Marine invertebrates	2,612
Helminthological collection	247
Comparative anatomy	96
Plants	49,508

Geology:

Physical and chemical geology	1,105
Mineralogy	410
Stratigraphic paleontology	33,073

Total	457,096
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¹ Including 2,206 specimens relating to physical anthropology.

² Number of catalogue entries.

*Number of specimens in the Divisions of the Museum June 30, 1898.***Anthropology:**

Ethnology	¹ 451, 655
Historic archæology	1, 872
Prehistoric archæology	276, 540
Technology	30, 421
Graphic arts	7, 234
Medicine	7, 000
Religions	1, 858
History and biography	36, 156

Biology:

Mammals	² 21, 985
Birds	112, 274
Birds' eggs	64, 272
Reptiles and batrachians	38, 122
Fishes	150, 600
Mollusks	725, 036
Insects	869, 236
Marine invertebrates	510, 765
Helminthological collection	³ 4, 746
Comparative anatomy	15, 491
Plants	368, 241
Forestry	749

Geology:

Physical and chemical geology	77, 662
Mineralogy	29, 308
Stratigraphic paleontology	355, 185

Total	4, 156, 408
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NOTE.—The Division of Ethnology embraces the ethnological and pueblo collections of 1896-97; the Division of Historic Archæology, a portion of the collection of oriental antiquities and religious ceremonials; the Division of Technology, the collections relating to transportation and engineering, naval architecture, physical apparatus, electricity, musical instruments, pottery and porcelain, paints and dyes, oils and gums, chemical products, animal products, foods, fisheries, textiles, domestic animals; the Division of Graphic Arts, the collections of graphic arts and photographs; the Division of Religions, a portion of the collections of oriental antiquities and religious ceremonials.

More than 27,000 entries have been made in the catalogues of the various divisions.

A complete list of the specimens acquired during the year by gift, deposit, exchange, and purchase will be found in Appendix II.

¹ Including a series of specimens relating to physical anthropology received during the fiscal year ending June 30, 1898.

² Including those specimens which were added to the Department of Agriculture collection during 1897-98.

³ Number of catalogue entries.

The number of accessions during each year since 1881 is shown in the following table:

Year.	Accession numbers (inclusive).	Number of accessions during the year.
1881.....	9890-11000	1, 111
1882.....	11001-12500	1, 500
1883.....	12501-15900	1, 400
1884.....	13901-15550	1, 650
1885 (January to June).....	15551-16208	658
1886.....	16209-17704	1, 496
1887.....	17705-19350	1, 646
1888.....	19351-20831	1, 481
1889.....	20832-22178	1, 347
1890.....	22179-23340	1, 162
1891.....	23341-24527	1, 187
1892.....	24528-25684	1, 357
1893.....	25685-27150	1, 266
1894.....	27151-28311	1, 161
1895.....	28312-29534	1, 223
1896.....	29535-30833	1, 299
1897.....	30834-32300	1, 467
1898.....	32301-33741	1, 441

During the year, 25,405 packages were received by the Registrar. Of this number, 690 contained specimens for the Museum collections (an increase of 79 over the record for the previous year), 1,724 contained supplies of various kinds for use in the offices and shops of the Museum, and 11,522 consisted of publications. Three thousand and seventy-three packages were sent out.

The entries on the outgoing transportation record numbered 1,482 and on the incoming transportation record 3,137.

Seven carloads of material were shipped to the Trans-Mississippi and International Exposition at Omaha.

Two hundred and twenty-one packages were placed in storage and 57 were withdrawn.

DISTRIBUTION AND EXCHANGES.

Thirty-two thousand three hundred and sixty-three specimens were sent out as gifts or in exchange, and 7,461 specimens were lent for study during the year. A number of sets of marine invertebrates have been prepared with a special view to supplying the needs of schools, and these have been distributed to the number of about 17,000 specimens. Many collections of rocks and ores and casts of prehistoric implements were also presented to educational establishments.

A complete list of the distributions of the year is printed in Appendix III.

The following statement, arranged geographically, shows the number of "lots" of specimens sent out:

Alabama.....	1	South Carolina.....	3
Arkansas.....	1	Tennessee.....	1
California.....	15	Texas.....	3
Colorado.....	4	Utah.....	2
Connecticut.....	4	Vermont.....	1
Delaware.....	3	Virginia.....	3
District of Columbia.....	15	Washington.....	2
Florida.....	1	Wisconsin.....	6
Georgia.....	3	Wyoming.....	1
Illinois.....	15	Foreign countries:	
Indiana.....	4	Africa.....	2
Iowa.....	23	Argentina.....	1
Kansas.....	4	Australia.....	1
Kentucky.....	1	Austria.....	2
Louisiana.....	1	Canada.....	3
Maine.....	7	Denmark.....	1
Maryland.....	5	England.....	10
Massachusetts.....	30	France.....	4
Michigan.....	3	Germany.....	4
Minnesota.....	3	India.....	2
Missouri.....	6	Italy.....	1
Montana.....	1	Japan.....	2
Nebraska.....	4	Netherlands.....	2
New Hampshire.....	1	Norway.....	1
New Jersey.....	1	Russia.....	3
New York.....	42	Scotland.....	1
North Carolina.....	5	Sweden.....	2
Ohio.....	4	Switzerland.....	1
Oregon.....	1		
Pennsylvania.....	14	Total.....	288
Rhode Island.....	1		

Several exchanges have been conducted with institutions and individuals in foreign countries, resulting in the acquisition of some valuable material.

It is questionable whether this branch of the Museum work is taken as a whole year by year, very profitable. It is difficult to arrange satisfactorily the details of an exchange with an establishment several thousands of miles away. The necessity of determining one uncertain point may cause a delay of several months, during which time other opportunities for utilizing the material intended for exchange may have arisen. Valuations placed on specimens vary, and what may seem to us a generous offer on our part may be regarded as far from being an equivalent to the other party. In certain cases it is impossible to furnish first class specimens, and the failure to do so, although explanation may have been made in the correspondence leading to the exchange, has not unfrequently placed this Museum in an undesirable and undeserved position. Furthermore, it seldom happens that the establishment with which an exchange is being conducted is willing to part with its best material, especially if sending first. Specimens which

were in good condition when shipped often deteriorate before reaching their destination, and this again furnishes ground for dissatisfaction.

It is not likely, however, that transactions with establishments and individuals who have been exchanging material with this Museum, to the satisfaction of both, will be discontinued, although it is doubtful whether special pains will be taken to extend negotiations of this character into untried fields.

A number of exchanges which have been pending for special reasons were completed during the year just closed. Among the most important transactions the following may be mentioned:

From the Imperial Royal Natural History Museum, Vienna, Austria, 66 specimens of Tertiary corals were received in exchange for Lower Cretaceous fossils. The Paleontological Museum of the Royal Academy, Munich, Bavaria, received from the U. S. National Museum 16 specimens of Cambrian fossils, in exchange for material sent some time ago. Thirty-three specimens of fossil plants, representing 20 species, were received from the Natural History Society of New Brunswick, St. John, and 90 specimens of fossil plants have been sent in return. The Branicki Museum, Warsaw, Russia, has received 170 bird skins from the National Museum, in continuation of exchanges. Land shells from Transcaspia and the Caucasus and marine shells from the coast of Russia have been received from the Zoological Museum of the Imperial Academy of Sciences, St. Petersburg, in exchange for about 2,000 specimens of shells from the National Museum. Mons. M. Cossmann, Paris, France, sent a collection of shells in exchange for publications. Sixty-two specimens of Actinians have been transmitted to the Royal Museum of Natural History, Stockholm, Sweden, in exchange for material yet to be forwarded. Crustaceans have been sent to the Museum of Natural History, Geneva, Switzerland, in return for specimens already received and in continuation of exchanges.

Mr. T. Wayland Vaughan, of the U. S. Geological Survey, was authorized to arrange exchanges with several foreign museums during his visit to Europe in the summer of 1897. He made an especial effort to obtain corals from the Cretaceous and Tertiary formations of Europe. Series of specimens have already been received from the Geological-Paleontological Institute, Munich, Bavaria, and the Geological Society of London; also from the Imperial Royal Natural History Museum, Vienna, as stated above.

LABELS.

Ninety-eight requisitions were received from the various divisions of the Museum during the year. Twelve of these were sent to the Government Printing Office to be filled, namely, requisitions for binding 482 books; for printing 3,958 labels, representing 197 forms, for printing 700 specifications for supplies; for binding 13 volumes of vouchers; for 500 manila pads, and 9 record books. There were printed at the Museum 209,205 labels (representing 6,640 forms), of which 48,998 (representing 3,902 forms) were for use in connection with the Tran-

Mississippi and International Exposition. More than 160,000 letter heads, envelopes, circulars, blanks, etc., representing 68 forms, were also printed.

VISITORS.

There were 276,527 visitors to the Smithsonian and Museum buildings during the year. The following tables show respectively the number of visitors during each month of the fiscal year just closed, and the total number during each year since the Museum building was opened in 1881:

Number of visitors during the fiscal year 1898.

Year and month.	Museum building.	Smithsonian building.
1897.		
July	13,827	6,019
August	14,827	6,347
September	15,500	7,704
October	14,800	7,105
November	13,018	7,668
December	13,286	8,154
1898.		
January	11,908	6,281
February	13,214	7,519
March	18,294	10,453
April	21,310	13,929
May	15,910	10,694
June	11,410	7,400
Total	177,254	99,273
Approximate daily average on a basis of 313 days in the year	566	317

Number of visitors to the Museum and Smithsonian buildings since the opening of the former in 1881.

Year.	Museum building.	Smithsonian building.	Total to both buildings.
1881	150,000	100,000	250,000
1882	167,455	152,744	320,199
1883	202,188	104,823	307,011
1884 (half year)	97,661	45,565	143,226
1884-85 ¹	205,026	105,993	311,019
1885-86	174,225	88,960	263,185
1886-87	216,562	98,552	315,114
1887-88	249,665	102,863	352,528
1888-89 ¹	374,843	149,618	524,461
1889-90	274,324	120,894	395,218
1890-91	286,426	111,669	398,095
1891-92	269,825	114,817	384,642
1892-93 ¹	319,930	174,188	494,118
1893-94	195,748	103,910	299,658
1894-95	201,744	105,658	307,402
1895-96	180,505	103,650	284,155
1896-97 ¹	229,606	115,709	345,315
1897-98	177,254	99,273	276,527
Total	3,972,987	1,998,886	5,971,873

¹ Years of Presidential inaugurations.

STUDENTS AND INVESTIGATORS.

During the year covered by this report the following persons have been accorded access to the collections in the Museum:

Mr. E. W. Nelson, of the Department of Agriculture, has spent much time in the study of Eskimo collections and has completed a monograph on the subject. Mr. P. C. Boyle, of Oil City, Pennsylvania, studied the collection of lamps and illuminating devices. Mr. Stewart Culin, Director of the Museum of Archæology and Palæontology, University of Pennsylvania, has had access to the collections of games in connection with the preparation of a paper. Mr. J. D. McGuire, of Ellicott City, Maryland, has continued his work upon the pipes of the American aborigines. The results of his investigations have been embodied in a paper which will appear in the Report of the Museum for 1897 (now in press). Major J. W. Powell, Director of the Bureau of American Ethnology, examined the pipes collected by himself in Utah many years ago. Dr. J. Walter Fewkes has prosecuted investigations upon the material which he recently collected in the Southwest, and has prepared a report upon his explorations during 1897-98. In the Division of Historic Archæology information has been given to the following: Mr. Richard Fisher, San Antonio, Texas; Mr. F. W. Hodge, Bureau of Ethnology; Hon. Oscar Straus, Mr. George W. Moon, London, England; and Prof. H. Hyvernât, of the Catholic University, Washington.

Prof. James Hine, of the Ohio State University, consulted the Museum collection of Neuroptera. Mr. Arthur C. Bradley, of Newport, New Hampshire, examined the Noctuidæ for the purpose of identifying specimens collected in New Hampshire. Mr. Nathan Banks, of the Department of Agriculture, has frequently examined the Arachnida and allied classes for purposes of study and identification. Prof. Roland Thaxter, of Harvard University, spent several days during March examining the collection of Coleoptera for minute fungi found growing on their elytra. He secured some very rare species from the exotic beetles. Professor Thaxter is engaged in monographing this group of fungi (the Laboulbeniaceæ). Mrs. Annie T. Slosson and Doctor Prime, of Franconia, New Hampshire; Mr. O. W. Barrett, of Clarendon, Vermont; Dr. J. W. Holland, of Pittsburg, Pennsylvania; Dr. H. G. Griffith and Mr. William J. Fox, of Philadelphia; Prof. F. M. Webster, of Wooster, Ohio; and many others have consulted the collections in the Division of Insects during the year.

Mr. E. W. Nelson, Department of Agriculture, spent three months or more studying the Museum collection of Mexican birds in connection with the determination of the material collected by him in Mexico for the Biological Survey. Mr. H. C. Oberholser, Department of Agriculture, studied the Horned Larks, with a view to revising the group; the forms of *Thryothorus bewicki*, with a view to the prep-

aration of a revision of the group; the series of *Amazilia cervini-ventris*, in order to determine the distribution of a new form; the series of *Megascops flammeolus*, for the purpose of determining the forms embraced under that name; also two small collections of birds from West Africa. Dr. A. K. Fisher, Department of Agriculture, examined the collection at various times in connection with his determination of certain type specimens and the identification of material for the Biological Survey. Mr. Outram Bangs, of Boston, Massachusetts, made use of the Museum collection in identifying a series of 700 birds from the Santa Marta region of Colombia. Mr. J. W. Garrett, of Baltimore, Maryland, consulted the library preparatory to identifying a collection of Patagonian birds. Mr. F. M. Chapman, of the American Museum of Natural History, New York, studied the petrels, in order to determine the validity of a Pacific coast form. Mrs. George O. Maynard and Miss Florence Merriam, both of Washington, examined certain North American birds, for the purpose of describing them in popular works on birds.

Miss Jennie E. Letson, of Buffalo, New York, devoted considerable time to the study of mollusks. Mr. Outram Bangs spent a few days in March, and again in May, making comparisons of North American species of mammals. Professor Mitsukuri, of the University of Tokyo, studied the collection of seals, in order to familiarize himself with their taxonomic character. Mr. E. W. Nelson, of the Department of Agriculture, was given facilities for an extended study of the squirrels of Mexico and Central America. Mr. George R. Wieland, State College, Pennsylvania, examined specimens of marine and fresh-water turtles. Dr. David S. Jordan, president of the Leland Stanford Junior University, examined fishes in connection with a report upon the investigations of the Fur Seal Commission, and in connection also with the preparation of additional volumes of the work on the "Fishes of North and Middle America."¹ Dr. B. W. Evermann, who is associated with Doctor Jordan as joint author of the above work, also made frequent use of the collections. Dr. H. M. Smith and Dr. W. C. Kendall, of the U. S. Fish Commission, compared specimens of fishes in the collection with others recently obtained by the Commission.

Miss Harriet Richardson made a study of certain groups of Isopoda, including species of the genera *Rocinela* and *Æga*, and is preparing an annotated list of the Isopoda of the west coast of North America. In November Prof. K. Mitsukuri, of the University of Tokyo, spent about a week at the Museum studying the Holothuroidea obtained during the cruise of the *Albatross* to the Galapagos Islands in 1891. In February, Mr. K. Kishinouye, of Tokyo, was engaged for two weeks in studying the Medusæ and the Penæidæ. Since early in May Dr. Charles M. Blackford, jr., of the Medical College of Georgia, has been engaged in studying the Protozoa and other low forms of life.

Miss Anna Murray Vail, of the Torrey Botanical Club, New York

¹ Bulletin 47, U. S. National Museum.

City, spent a few days at the Herbarium in individual work on the *Asclepiadaceæ*, which she is engaged in monographing. Dr. John K. Small, curator of the Herbarium of Columbia University, New York City, consulted the Herbarium frequently during a short visit to Washington in August, and in connection with his work he greatly assisted the Museum by making a number of critical determinations. Mr. C. H. Thompson, of the Missouri Botanical Gardens, St. Louis, was engaged for a few days in the study of *Lemnaceæ*. Prof. L. M. Underwood, Columbia University, New York, visited the Herbarium in November and studied the *Pteridophyta*. Prof. E. L. Greene, of the Catholic University, Washington, frequently consulted the collection. He has made many valuable suggestions, and has generously placed his library at the disposal of members of the Museum staff. Through the opportunity thus afforded of studying certain works not to be found elsewhere in the city, the members of the staff have been materially aided in certain lines of investigation. Mr. William Canby, of Wilmington, Delaware, made several visits to the Herbarium, and has contributed some valuable plants. Mr. Canby has long been a correspondent of the Museum, and has added many rare plants to the collection. Mr. Hermann von Schrenk, of the Missouri Botanical Gardens, spent a short time at the Herbarium in June. Prof. F. A. Waugh, of the University of Vermont, examined certain specimens. Professor Ruth of the University of Tennessee inspected the arrangements in the Herbarium.

In the Division of Stratigraphic Paleontology many visitors have requested the privilege of examining specimens, and their wishes have been acceded to whenever practicable. Dr. E. C. E. Lord, of the U. S. Geological Survey, and Dr. Thomas L. Watson, of Cornell University, Ithaca, New York, studied the collections in the Division of Geology. Prof. O. P. Hay has examined the large Cretaceous fishes from Kansas with a view to deciding certain points in the structure of the skull and vertebral column, and also to ascertain whether or not the genus *Portheus* is synonymous with *Xiphactinas*. Several new points in the structure and affinities of *Xiphactinas* were ascertained and the conclusion reached that *Xiphactinas* Leidy was identical with *Portheus* Cope, the latter name being a synonym. Prof. Henry F. Osborn studied the types of such species of *Coryphodon* as are contained in the collections, with the intention of making a revision of the species of that genus.

On January 7, 1898, Miss Mary Bartlett Smith was given permission to serve as volunteer assistant in the Division of Marine Invertebrates.

The privilege granted to visitors to the Smithsonian and Museum buildings of photographing and sketching objects in the exhibition halls has been availed of by a large number of persons. Many classes from the public and private schools of Washington visited the Museum

during the year, and pupils from a number of schools outside of Washington also inspected the collections.

It may be stated here that permission can not be granted to photograph objects on deposit and not the property of the Museum, until the written consent of the owners has been obtained, nor can prints from Museum negatives be furnished in such cases without the consent of the owners.

Material has been sent out for examination as follows:

Objects of pottery, jade and serpentine axes and ornaments, ceremonial axes, banner stones, and drilled and figured tablets were sent to Mr. F. H. Cushing, Bureau of Ethnology. Bone gaming implements were transmitted to Mr. Stewart Culin, of the University of Pennsylvania, for use in the preparation of a paper on games. A collection of games from the Philippine Islands was also sent. A series of Ute pipes was lent to Maj. J. W. Powell, Director of the Bureau of Ethnology.

From the Division of Fishes the following material has been sent out for study: To Dr. D. S. Jordan, Leland Stanford Junior University, California, specimens of *Sebastes marinus*, *Sebastolobus alascanus*, certain species of the genera *Zeus*, *Chatodon*, *Holocentrus*, and *Ammodytes*, and a small collection of fishes made near the Commander Islands in 1897, by Dr. Leonhard Stejneger; to the Museum of Comparative Zoology, Cambridge, Massachusetts, at the request of Professor Garman, two specimens of *Phycis regius*; to Dr. T. H. Bean, specimens of *Pantosteus plebeius*; to Dr. C. H. Eigenmann, Indiana University, Indianapolis, Indiana, specimens for study in the preparation of a review of the blind fishes; to S. Watase, Chicago, specimens of phosphorescent fishes, for study in connection with the preparation of a paper upon the phosphorescent organs of animals.

Frequent use of the collection in the Division of Mammals has been made by specialists of the Department of Agriculture, and a number of specimens were borrowed, including types of *Reithrodon montanus*, *Perognathus monticola*, *P. californicus*, *Microtus edax*, *M. californicus*, *Peromyscus boylii penicillatus*, *Hesperomys melanophrys*, *Perognathus penicillatus*, and *P. spinatus*. There were sent to Mr. Outram Bangs, Boston, Massachusetts, 5 skulls of certain species of *Putorius* and 5 skulls of species of *Erethizon*; to Mr. S. N. Rhoads, Academy of Natural Sciences, 7 skulls of mammals; to R. Lydekker, Harpenden, Hertfordshire, England, 1 deer skull; to Dr. E. A. Mearns, Fort Clark, Texas, 457 rodents from the Mexican boundary; to Mr. L. McNally, 1 muskrat; to Dr. J. A. Allen, American Museum of Natural History, New York City, 196 red squirrels, and to Mr. J. D. Sornborger, Cambridge, Massachusetts, 1 white-footed mouse. The specimens sent to Dr. Mearns were for use in completing his report on the mammals of the Mexican boundary, and those to Dr. Allen for use in a revision of the red squirrels.

From the Division of Birds there were sent to Mr. Joseph Grinnell, Pasadena, California, 24 specimens of *Spinus tristis*, to enable him to determine the forms inhabiting California, 32 specimens of *Salpinctes obsoletus*, for use in determining the identity of a form inhabiting the islands off California, and 22 specimens of *Harporhynchus*; to Mr. Witmer Stone, Academy of Natural Sciences, Philadelphia, 25 specimens of *Calidris arenaria*, for use in connection with investigations relating to the molting of birds; to Mr. F. M. Chapman, American Museum of Natural History, New York, 7 specimens of *Carpodacus mexicanus*, for use in the determination of a form collected by him in Mexico, 1 specimen of Kirtland's Warbler, and 42 specimens of Seaside Sparrows, for examination with a view to determining the different forms; to Prof. Alfred Newton, Cambridge, England, 1 specimen of *Phaornis* for examination; to Edwin Sheppard, Academy of Natural Sciences, Philadelphia, Pennsylvania, 12 specimens of ducks and geese in down, to be used in preparing illustrations for a work by Professor Elliott; to Dr. E. A. Mearns, Fort Clark, Texas, 96 Canyon Wrens, for use in a study of these birds, and to Mr. O. W. Knight, Bangor, Maine, 8 specimens of *Cistothorus stellaris*, for examination.

From the Division of Reptiles and Batrachians, thirty-four specimens of frogs were sent to Mr. Reginald Heber Howe, Museum of Comparative Zoology, Cambridge, Massachusetts, for examination in connection with his forthcoming paper on the Wood Frogs of North America.

From the Division of Insects the following material has been lent: To Prof. William Beutenmüller, American Museum of Natural History, New York City, 8 specimens of Sesiidæ, for use in a revision of this family; to Mr. John Hartley Durrant, Merton Hall, Thetford, England, 7 Tineids, required by Lord Walsingham in his revision of the Tineidæ; to Mr. H. C. Fall, Pasadena, California, all the material in the genus *Acmaeodera*, for the purpose of drawing up a synopsis of the species; to William J. Fox, Academy of Natural Sciences, Philadelphia, material for use in monographing the family Mutillidæ; to Prof. James S. Hine, Ohio State University, Columbus, Ohio, material in the genus *Bittacus*, for formulating a synopsis of the species; to Dr. George D. Hulst, 15 Himrod street, Brooklyn, New York, 284 specimens belonging to the family Geometridæ, for determination; to Dr. R. Ottolengui, 4 species of *Plusia*; and to Prof. John B. Smith, New Brunswick, New Jersey, 168 Noctuidæ, for study and identification.

The following material has been sent out from the division of marine invertebrates: To Dr. F. Meinert, Zoological Museum, Copenhagen, the general collection of Pycnogonida, for the purpose of monographing the group; to Prof. F. H. Herrick, Adelbert College, Cleveland, Ohio, the general collection of Alpheidæ, to be used also in monographic work; to Dr. David S. Jordan, Stanford University, California, the compound ascidians collected at the Commander Islands by Doctor Stejneger, to be transmitted to Dr. William E. Ritter, who is making a special

study of the compound ascidians of the North Pacific. Dr. Walter Faxon, Museum of Comparative Zoology, Cambridge, Massachusetts, asked for the loan of three crayfishes, for use in the preparation of a paper, which was afterwards published in the Proceedings of the National Museum. A specimen of *Lithodes æquispinus* Benedict was also sent to Doctor Faxon for comparison with Japanese specimens. Seven lots of crabs, for use in a report on the Crustacea of the western coast of the United States, were sent to Mr. S. J. Holmes, Chicago, Illinois.

From the Division of Plants, the following material has been lent: To Mr. W. W. Ashe, State Geological Survey, Raleigh, North Carolina, 67 specimens of *Asarum*; to Prof. L. H. Bailey, Cornell University, Ithaca, New York, 385 specimens of *Rubus* and 1 specimen of *Carex*; to Mr. C. D. Beadle, Biltmore, North Carolina, 68 specimens of *Philadelphus*; to Mr. T. S. Brandegee, San Diego, California, 1 specimen of *Cereus alamosensis*, and 8 specimens of *Cacti*; to Dr. N. L. Britton, Columbia University, New York City, 31 specimens of *Nabalus*, 1 specimen of *Lacinaria*, 1 specimen of *Eupatorium*, 638 specimens of *Asclepias*, 2 specimens of *Aster*, 35 specimens of *Ophioglossum*, and 77 specimens of *Viola*; to Mrs. E. G. Britton, Columbia University, New York City, 17 pockets of mosses; to Prof. E. S. Burgess, Normal College, New York City, 483 specimens of *Aster*; to Mr. George E. Davenport, Medford, Massachusetts, 69 specimens of Mexican plants and 2 specimens of ferns; to the director of the Royal Botanic Gardens, Kew, England, 54 specimens, mostly of *Eryngium*; to Mr. J. M. Greenman, Cambridge, Massachusetts, 92 Mexican plants, 49 specimens of *Galium* and *Relbunium*, and 373 specimens of Mexican compositæ; to Mr. A. J. Grout, Plymouth, New Hampshire, 199 specimens of *Eurhynchium*. Mr. Theodor Holm, Washington, District of Columbia, received for study 71 miscellaneous specimens of plants; Dr. O. F. Millspaugh, Columbian Museum, Chicago, Illinois, 8 specimens of Mexican plants; L. H. Pammel, Ames, Iowa, 153 specimens of plants; Dr. B. L. Robinson, Gray Herbarium, Cambridge, Massachusetts, 3 specimens of *Anoda* and 157 specimens of other plants; Prof. W. W. Rowlee, Cornell University, Ithaca, New York, 124 specimens of *Salix*; Mr. O. S. Sargent, Jamaica Plain, Massachusetts, 2 specimens of *Populus*; Dr. John K. Small, Columbia University, New York City, 107 specimens of *Eriogonum*, 1 specimen of *Styrax*, 11 specimens of *Scutellaria*, and 7 specimens of *Cyrtopodium*; Prof. William Trelease, Missouri Botanical Gardens, St. Louis, Missouri, 138 specimens of *Lemna* and 268 specimens of *Croton*; Prof. L. M. Underwood, Columbia University, New York City, 8 specimens of fern allies and 15 sheets containing 34 pockets of *Riccia*.

A collection of fossils belonging to certain species of the Hamilton group, collected by Mr. C. Schuchert at Thedford, Ontario, was sent to Prof. J. F. Whiteaves, Ottawa, Canada. Mr. Whiteaves is monographing the species of this locality. Some molars of *Coryphodon* were sent to Prof. Henry L. Osborn to aid in his revision of the species of the

genus, and plates of *Dinichthys pustulosus* were lent to Dr. O. R. Eastman of the Museum of Comparative Zoology, Cambridge, Massachusetts. English Carboniferous pelecypods were sent to Dr. G. H. Girty of the U. S. Geological Survey. A collection of thin sections of slates was lent to Prof. T. Nelson Dale, Williamstown, Mass.

In the foregoing paragraphs allusion is made only to specimens sent in response to special applications. In addition, a large number of sets of marine invertebrates, minerals, rocks and ores, etc., have been distributed among educational establishments desiring such material both for study and exhibition. In this connection it may be stated that very few of these collections are left, and unless special provision be soon made by Congress which will enable the Museum to engage the services of competent assistants to select the duplicate specimens from the various collections and make them up into sets, that branch of Museum work will have to be practically suspended. It is quite impossible for the present force of assistants in the scientific divisions to leave their regular duties for special work of this character, which, while very desirable and intended to be helpful to other museums, colleges, etc., has in it no element of gain whatever to the National Museum.

COOPERATION OF THE EXECUTIVE DEPARTMENTS OF THE GOVERNMENT.

The cooperation of the various Executive Departments and Bureaus of the Government has continued during the year, and has resulted, as usual, in the addition to the collections of valuable and interesting material. This is especially so in the case of the U. S. Geological Survey, the U. S. Fish Commission, and the Department of Agriculture. The Museum not only benefits largely by the law providing that all Government collections shall be turned over to it after they have served the purpose for which they were obtained, but it also profits materially by the hearty cooperation and courtesy so frequently manifested by Government officials. A statement of the material transmitted by the various Departments will be found in the Accession List (Appendix II). The collections of particular interest are also referred to by the head curators in their annual reports.

Especial mention should be made of the valuable services rendered without remuneration by many of the members of the scientific staff of the Museum. There are now thirteen curators, one assistant curator, and fifteen custodians who serve the Museum without pay. The majority of these are in the employ of other Departments or Bureaus of the Government, but have willingly given to the Museum such time and attention as could be spared from their regular official duties. There are also two collaborators, three associates in zoology, and one in paleontology who are attached to the staff in an honorary capacity.

IDENTIFICATION OF SPECIMENS AND INFORMATION FURNISHED.

During the year 576 "lots" of specimens (Nos. 4494-5069, inclusive) were received for examination from individuals and educational establishments in various sections of the country. Of this material the percentage which has been of sufficient interest for addition to the Museum collections is very small. This branch of the work yields little or no profit to the Museum, since the senders of valuable material almost invariably request its return. Moreover, the condition in which material is received is frequently a source of delay in securing prompt determinations. In many instances the specimens are almost entirely destroyed during transmittal, owing to insufficient packing.

Pamphlets describing the manner in which specimens of various kinds may best be collected and prepared for shipment have been widely distributed, and it is hoped that persons desiring to avail themselves of the facilities which the Museum affords in the identification of specimens will comply with the suggestions which they contain.

Technical information on various subjects has been furnished to a large number of correspondents during the year, and drawings or blue prints of Museum cases have been transmitted to those who have applied for them. There is hardly a day when from thirty to forty letters are not written in response to communications received from persons seeking definite knowledge of some kind.

PUBLICATIONS.

The Annual Report of the Museum for 1895 has been published, and the papers in the Appendix have also appeared in separate form. The Report for 1896 is now in type, with the exception of the index, and the proof reading of the administrative portion of the volume for 1897 has been completed.

Volume XIX of the Proceedings has been published. Most of the papers in this volume were issued in separate form during the preceding fiscal year. The last four, however, were published since July 1, 1897. Papers 1124-1139, inclusive, constituting Volume XX, have appeared.

The titles of all papers which have been published in separate form, during the year are given in Appendix V.

The text of Bulletin 47 is now all in type, with the exception of the "addenda." The work, when completed, will consist of three volumes and an atlas.

Another of the series of pamphlets containing directions for collecting and preserving natural history specimens has been issued.¹ This paper is by Prof. T. D. A. Cockerell, and contains instructions for the collection of scale insects. Circular 48, which has also been published,

¹ Bulletin 39, Part L.

relates to collecting and preserving the bones and teeth of specimens of Mastodon and Mammoth.

The titles of a large number of papers published during the year by officers of the Museum and other investigators are given in the Bibliography (Appendix IV). Many of these papers appeared in publications other than those of the Museum. The number of authors represented is 83, and the total number of papers mentioned, 234. The subjects treated upon are indicated in the following table:

Subject.	Papers by Museum officers.	Papers by other investigators.	Total.
Administration	1		1
Archæology	2		2
Bibliography	1		1
Biography	3		3
Biology	1		1
Birds	15	19	34
Birds' eggs	1	1	2
Botany	19		19
Comparative anatomy	1		1
Ethnology	7	4	11
Exploration	1		1
Fishes	6	6	12
Forestry	2		2
Fossils	11		11
General natural history	1		1
Geology	4		4
Insects	38	14	52
Mammals	9	4	13
Marine invertebrates	10	3	13
Mollusks	15	12	27
Parasites	12	5	17
Reptiles and batrachians	1		1
Taxidermy		1	1
Miscellaneous	4		4
Total	165	69	234

The Secretary of the Smithsonian Institution, in an order dated March 19, 1898, placed 5,800 copies of the Museum Report at the disposal of the Museum, retaining 1,200 copies, out of the edition of 7,000 allotted to both establishments, for distribution by the Institution itself. This increase enables the Museum to supply a large number of public libraries and schools which had not heretofore received the volume.

In the last Annual Report mention was made of an arrangement by which members of the scientific staff might, with the approval of the Secretary of the Smithsonian Institution, print papers based upon Museum material in publications other than those of the Museum. During the year permission has been given to publish sixteen papers in this way. The names of the authors are as follows: James E.

Benedict, Miss M. J. Rathbun, J. N. Rose, Gerrit S. Miller, jr., Walter Hough, Robert Ridgway, David White, Charles Schuchert, and Miss Harriet Richardson. The titles of those papers which have been published within the fiscal year will be found in the Bibliography (Appendix IV).

LIBRARY.

The librarian, Dr. Cyrus Adler, states that the accessions for the year were as follows: Books, 848; pamphlets, 1,945; parts of periodicals, 16,746; total, 19,539. These figures include the publications retained from the accessions to the library of the Smithsonian Institution, which were as follows: Books, 407; pamphlets, 1,148; parts of periodicals, 11,817. One thousand books belonging to the Smithsonian deposit and 409 belonging to the Museum were bound.

More than 10,000 books were borrowed during the year, a considerable proportion of these being assigned to sectional libraries. About 17,000 books were consulted in the library.

The work of transferring titles to the new catalogue is progressing.

Two new sectional libraries have been organized during the year—Technology and Stratigraphic Paleontology. There are now twenty-three authorized sectional libraries, as follows:

Administration,	Mesozoic fossils,
Birds,	Mineralogy,
Botany,	Mollusks,
Comparative anatomy,	Oriental antiquities,
Ethnology,	Paleobotany,
Fishes,	Parasites,
Geology,	Photography,
History,	Prehistoric archæology,
Insects,	Reptiles,
Mammals,	Stratigraphic paleontology,
Marine invertebrates,	Technology.
Medicine,	

EXPLORATIONS.

A quantity of valuable material has come into the possession of the Museum through explorations conducted by members of the Museum staff, by other individuals, and by various bureaus of the Government.

Dr. W. L. Abbott has sent in large collections of birds, mammals, reptiles, insects, and other animals collected by himself in lower Siam and Kashmir, thus very materially adding to the valuable series of specimens which have been received from him in past years.

Prof. Dean C. Worcester, of Ann Arbor, Michigan, contributed a large series of bird skins, eggs, and nests collected in the Philippine Islands.

An interesting series of bird skins collected in Santa Marta, Colombia, was received from Mr. Outram Bangs, Boston, Massachusetts.

The Biological Survey of the Department of Agriculture, the U. S. Fish Commission, and other Governmental bureaus have continued to

send in valuable collections obtained by their representatives in the field.

A large lot of invertebrates collected by the naturalists of the steamer *Albatross* in recent years on the coasts of California, Japan, and Kamchatka and in the Bering Sea should receive special notice.

A large series of land shells collected in Mexico by the Biological Survey constitutes an addition of more than ordinary value.

The expedition made by Mr. R. P. Currie in the neighborhood of Mount Coffee, Liberia, West Africa, under the auspices of the Museum and with the valuable assistance of Prof. O. F. Cook, of the Colonization Society, resulted in the acquisition of a large number of insects, spiders, and myriapods, numbering in all about 5,000 specimens, and some valuable reptiles, birds, and mammals. Dr. Leonhard Stejneger, while pursuing investigations on the Commander Islands as a member of the Fur Seal Commission, collected birds, insects and other animals for the Museum. Of the insects 28 were found to represent new species and others were very rare. Mr. Robert Ridgway made an exploration for the Museum in the vicinity of Lake Okechobee, Florida, and obtained a considerable number of rare birds.

Mr. J. N. Rose was engaged for four months in the summer and fall of 1897 in making a botanical collection in western and central Mexico. He visited a little known part of the country and succeeded in bringing back a large and valuable collection of plants. The collection includes more than 6,000 specimens and contains more than 100 species new to science. Mr. Rose also succeeded in obtaining some interesting ethnological specimens, including spinners, reels, etc., used by the natives in converting cotton and Agave fiber into thread, strings, and rope. This collection also includes native cups, spoons, mats, hats, ropes, etc. In each case botanical specimens were obtained which show definitely the origin of the products.

Early in March an opportunity was presented for a botanist to accompany an expedition to the Keys of south Florida, undertaken by Messrs. E. L. Morris and G. N. Collins for the purpose of making general scientific collections. Mr. Pollard was authorized by the Acting Assistant Secretary in charge of the Museum to accompany the expedition, leave of absence for two months on full pay being granted him on condition that the Museum receive a set of the botanical specimens obtained, and that it should not assume payment of transportation or other expenses. On March 4 Mr. Pollard proceeded directly with his companions to Key West; the party there engaged a boat and made a complete circuit of the Keys, reaching Miami, on the coast of Florida, April 5. After a week spent at the latter place, the expedition returned by steamer to Key West and thence to Washington. About 250 species of plants were obtained. These have since been determined by Mr. Pollard and will form the subject-matter of a report to be presented for publication at an early date.

Dr. F. W. True and Mr. D. W. Prëntiss, jr., obtained natural history material, including about 80 specimens of reptiles and batrachians in Maine.

Dr. George P. Merrill, during his visit to Russia in the summer of 1897, collected some interesting geological material.

Mr. Charles Schuchert, assistant curator of the Division of Stratigraphic Paleontology, accompanied an expedition under the direction of Lieutenant Peary, U. S. N., in July, for the purpose of gathering fossils and other natural history material in the region of Noursoak Peninsula, Greenland, and with a view especially to obtaining specimens from the vicinity of Disko Island, to serve as a basis of comparison with related material gathered from the Cretaceous of the United States. Mr. David White, of the U. S. Geological Survey, accompanied Mr. Schuchert. A large collection of Cretaceous and Tertiary plants was secured; also some interesting specimens of fishes and mollusks.

About 1,300 specimens of pottery and other relics from the vicinity of Tucson, Arizona, have been received from Dr. J. W. Fewkes as a further result of his explorations in that region. Dr. Walter Hough, assistant curator of the Division of Ethnology, accompanied Dr. Fewkes in the summer of 1897.

A number of unique ethnological specimens obtained by Mr. J. B. Hatcher in Patagonia were received from the Bureau of Ethnology.

Material of great value obtained by the exploring parties of the Bureau of Ethnology has also been received.

Collectors' outfits.—Outfits have been furnished to the following persons, who have undertaken to collect material for the National Museum: Mr. Edward J. Brown, Lemon City, Florida; Mr. John G. Webb, Osprey, Florida; Rev. D. W. Snyder, for collecting in Africa; Dr. Edgar A. Mearns, U. S. A., Fort Clark, Texas; Hon. J. D. Mitchell, Victoria, Texas; Prof. A. E. Verrill, Yale Collegè, New Haven, Connecticut; Mr. George D. Wilder, Pekin, China; Mr. J. A. Loring, Owego, New York, for collecting in European countries; Mr. J. S. Holmes, Bowman's Bluff, Henderson County, North Carolina.

Several members of the Museum staff have also been furnished with collecting outfits, as follows: Mr. Charles Schuchert, Mr. David White, Doctor F. W. True, Miss M. J. Rathbun, Mr. William Palmer, Dr. Walter Hough, and Mr. Robert Ridgway.

In addition to the collecting trips undertaken by members of the Museum staff, several of the curators and assistants were absent from time to time during the year on other business pertaining to the Museum. Some were temporarily in the employ of other departments or bureaus of the Government.

Thus Mr. F. A. Lucas was absent for several months during 1897, having been detailed by the President to visit Alaska as a member of the Fur Seal Commission. Dr. Stejneger was also a member of this

Commission. Mr. Barton A. Bean, assistant curator of fishes, was placed on detached service, with instructions to report on July 4 to the U. S. Fish Commission, to accompany in the capacity of temporary field assistant, a party sent out by the Commission for the purpose of conducting an examination of the fish fauna of the group of lakes lying east of the Klamath Lakes in southern Oregon. All necessary expenses in connection with Mr. Bean's trip were defrayed by the Commission. Dr. Thomas Wilson, curator of the Division of Prehistoric Archaeology, was requested, in connection with his duties as Commissioner from the Government of the United States to the International Exposition held at Brussels, Belgium, in 1897, to avail himself of the opportunities offered by his stay in Brussels to make excursions to points of archaeological interest within convenient reach of the Belgian capital, and to visit especially the newer anthropological museums of Belgium and Holland. He was directed to give particular attention to collecting information concerning the buildings occupied by these museums, the interior arrangements (exhibition halls, laboratories, storage facilities, etc.), and their methods of preparing, labeling, and installing specimens. He was also authorized to attend, as delegate from the Institution and Museum, any congresses or other scientific meetings relating to anthropology held in Brussels during the exposition.

In September Mr. J. E. Watkins, chief of buildings and superintendence, proceeded to New York City for the purpose of examining the exhibition cases in the American Museum of Natural History and the Metropolitan Museum of Art.

Prof. O. T. Mason, curator of the Division of Ethnology, visited Chicago in November for the purpose of examining the collections in the Field Columbian Museum.

On December 22 Mr. Charles Schuchert, assistant curator of the Division of Stratigraphic Paleontology, was directed to proceed to Waynesville, Ohio, for the purpose of representing the interests of the National Museum in the matter of shipping to Washington the collection of fossils and other specimens bequeathed to the Museum by the late Mr. I. H. Harris.

On February 25, 1898, Mr. Schuchert visited localities in New York, Ohio, Indiana, Illinois, Iowa, Kansas, Missouri, and Kentucky for the purpose of inspecting fossils in the hands of private collectors, with a view to completing the series to be exhibited at the Trans-Mississippi Exposition. He was directed to report upon the collections examined and make recommendations for the purchase of desirable material.

On April 16 Dr. Leonhard Stejneger, curator of the Division of Reptiles and Batrachians, proceeded to Philadelphia to examine collections at the residence of the late Prof. E. D. Cope, with a view to identifying specimens belonging to the Government but which had been temporarily in Professor Cope's hands for study. He was requested at the same time to avail himself of the opportunity offered by his presence in

Philadelphia to visit the Museum of the Academy of Natural Sciences for the purpose of arranging for the transmission to Washington of specimens belonging to the National Museum. Dr. A. C. Peale was also detailed to assist in this work.

On May 1 Dr. Stejneger left Washington for the purpose of visiting England and the continent of Europe, at his own expense, with a view to examining, in certain European museums, types of American species of reptiles and batrachians, and specimens of the birds and reptiles of Japan and of the north Pacific coast and adjacent islands. Dr. Stejneger attended the International Fisheries Exposition, which opened at Bergen, Norway, on May 16, with the expectation also of attending the Fourth International Zoological Congress, which convenes at Cambridge, England, on August 23. He was especially requested to secure information concerning new museum methods in northern Europe.

Mr. F. A. Lucas, acting assistant curator of Vertebrate Fossils, journeyed to New Haven on May 4 to receive from Prof. O. C. Marsh a number of fossil vertebrates for the Museum collection.

TAXIDERMY AND OSTEOLOGY.

Seventy-three mammals were received and skinned during the year. A considerable proportion of these came from the National Zoological Park, as shown in the following table:

Mammals received in the flesh.	From the Zoological Park.	From other sources.
Primates.....	6	1
Carnivora.....	13	2
Ungulata.....	10	.....
Chiroptera.....	.....	5
Rodentia.....	1	34
Marsupialia.....	1	.....
Total.....	31	43

In addition, 35 other specimens were received and immediately turned over to other departments of the Museum.

Two large crocodiles were received from the Zoological Park. One of these was skinned and preserved for mounting. A skin of an elk was made up for the study series; also the skin of a kangaroo, the skeleton being taken out entire in each instance.

Sixty-eight skins were received, as follows:

Carnivora.....	21
Ungulata.....	2
Rodentia.....	44
Cetacea.....	1
Total.....	68

The following table shows the number of dry skins made up for the study series:

Primates	7
Carnivora	21
Ungulata	11
Chiroptera	5
Insectivora	5
Rodentia	79
Marsupialia	1
Total	129

A specimen of *Bassaricyon gabbii* was mounted.

Several hundred large skins, both dry and in pickle, are on hand. A large number of skulls of mammals were cleaned.

Improvements were made in the groups exhibited in the mammal hall as follows: The two caribou groups were overhauled and renovated, as were also the African monkey group and the sea-otter group. A large number of single specimens were cleaned. A group of humming birds was designed and arranged for the Division of Birds, and a large number of minor matters received attention.

Mr. William Palmer, chief taxidermist, was in Nashville for nearly a month, engaged in repacking portions of the exhibit sent by the Museum to the Tennessee Centennial Exposition. Considerable work was also done by Mr. Palmer in connection with the Trans-Mississippi and International Exposition at Omaha. The taxidermists' shop was removed to new quarters during the year.

In the Division of Birds the taxidermists have cleaned and renovated about 2,500 specimens, and have mounted or remounted a number of others, a portion of them being intended for exhibition at the Trans-Mississippi Exposition. A collection of birds which was exhibited at the Tennessee Centennial Exposition was overhauled upon its return.

Various causes have combined to prevent satisfactory progress in osteological work during the period covered by this report. Considerable work has been accomplished, however, under adverse circumstances, as shown by the following table:

	Mammals.	Birds.	Reptiles.	Fishes.	Total.
Received in the flesh:					
Entire skeletons	6	14	3		23
Cleaned:					
Entire skeletons	2	1	11		14
Incomplete skeletons		1			1
Skulls	1,276		2		1,278
Mounted:					
Entire skeletons	4	4		2	10
Incomplete skeletons	1				1
Skulls	6				6
Total	1,295	20	16	2	1,333

PHOTOGRAPHY.

Seven hundred and forty-six negatives, 790 platinum prints, 686 silver prints, and 62 cyanotypes have been made for the various departments in the Museum. The catalogue of negatives in the custody of the photographer, Mr. T. W. Smillie, has been completed; 9,650 blue prints having been made for this purpose during the year.

EXPOSITIONS.

Tennessee Centennial Exposition.—This exposition opened at Nashville on May 1, 1897, and continued until October 31. An appropriation of \$130,000 was made by Congress for the preparation of a Government exhibit, the sum of \$14,500 being allotted to the Smithsonian Institution and the National Museum from this amount. A slight increase in the Smithsonian allotment was afterwards made. Collections were exhibited by the following divisions and sections of the Museum: Mammals, birds, reptiles and batrachians, fishes, mollusks, insects, marine invertebrates, comparative anatomy, paleontology, geology, minerals, ethnology, prehistoric archaeology, religions, technology, electricity, historical collections, and medicine.

The Report of the Smithsonian Institution for the present fiscal year contains a full account of the participation in the exposition by the Institution and its various bureaus.

Trans-Mississippi and International Exposition.—The Trans-Mississippi and International Exposition opened at Omaha on June 1, 1898, and will continue for five months. An appropriation of \$50,000 for the erection of a Government building was made by Congress, and this amount was afterwards increased to \$60,000, with an additional appropriation of \$2,500 for the erection of a building for an exhibit by the Life-Saving Service. The sum of \$137,500 was appropriated for an exhibit by the Executive Departments, the Smithsonian Institution, including the National Museum, and the U. S. Fish Commission. Of this amount \$19,491.71 was allotted to the Smithsonian Institution and its bureaus.

Exhibits have been prepared by each of the three scientific departments of the Museum—anthropology, biology, and geology. The Department of Anthropology has sent series illustrative of fire-making and illumination, exploitative industries, domestic arts, ceramic art, metal working, sculpture, photography, land and marine transportation, and the progress in certain branches of electrical engineering; groups of life-sized figures representing people engaged in primitive arts; series of weapons, tools, and musical instruments, and objects showing the history of the development of bookmaking. The exhibit of the Department of Biology includes series of the lower invertebrates, mollusks, insects, fishes, reptiles and batrachians, birds, mammals, and aquatic plants. The geological exhibits include series prepared in the divisions

of physical and chemical geology, mineralogy and stratigraphic paleontology. Each of the sections of the last-named division (namely, paleobotany, vertebrate and invertebrate fossils) is represented.

International Fisheries Exposition at Bergen, Norway.—Exhibits from the fisheries collection in the National Museum were lent to the U. S. Fish Commission for use in connection with its exhibit at the International Fisheries Exposition which opened at Bergen in May, 1898.

International Exposition at Paris.—The sundry civil bill, making appropriations for the fiscal year ending June 30, 1899, contains an item providing for the participation of the United States in the International Exposition to be opened in Paris on the 15th day of April, 1900.



APPENDIX I.

THE MUSEUM STAFF.

[June 30, 1898.]

S. P. Langley, Secretary of the Smithsonian Institution, Keeper, Ex-Officio.
Charles D. Walcott, Acting Assistant Secretary of the Smithsonian Institution in charge of the U. S. National Museum.
Frederick W. True, Executive Curator.

SCIENTIFIC STAFF.

DEPARTMENT OF ANTHROPOLOGY:

W. H. Holmes, Head Curator.

- (a) *Division of Ethnology*: O. T. Mason, Curator; Walter Hough, Assistant Curator; F. H. Cushing, Collaborator; J. W. Fewkes, Collaborator.
- (b) *Division of Historic Archaeology*: Paul Haupt, Honorary Curator; Cyrus Adler, Honorary Assistant Curator; I. M. Casanowicz, Aid.
- (c) *Division of Prehistoric Archaeology*: Thomas Wilson, Curator.
- (d) *Division of Technology (Mechanical phases)*: J. E. Watkins, Curator.
Section of Electricity: G. C. Maynard, Custodian.
- (e) *Division of Graphic Arts*: S. R. Koehler, Honorary Curator.
Section of Photography: T. W. Smillie, Custodian.
- (f) *Division of Medicine*: J. M. Flint, U. S. N., Honorary Curator.
- (g) *Division of Religions*:
Section of Historic Religious Ceremonials; Cyrus Adler, Custodian.
- (h) *Division of History and Biography*:
Section of American History: A. H. Clark, Custodian; Paul Beckwith, Aid.

DEPARTMENT OF BIOLOGY:

Frederick W. True, Head Curator.

- (a) *Division of Mammals*: Frederick W. True, Acting Curator; G. S. Miller, jr., Assistant Curator.
- (b) *Division of Birds*: Robert Ridgway, Curator; Charles W. Richmond, Assistant Curator; J. H. Riley, Aid.
Section of Birds' Eggs: William L. Ralph, Custodian.
- (c) *Division of Reptiles and Batrachians*: Leonhard Stejneger, Curator.
- (d) *Division of Fishes*: Tarleton H. Bean, Honorary Curator; Barton A. Bean, Assistant Curator.
- (e) *Division of Mollusks*: William H. Dall, Honorary Curator; C. T. Simpson, Aid; Paul Bartsch, Aid.
- (f) *Division of Insects*: L. O. Howard, Honorary Curator; W. H. Ashmead, Assistant Curator; R. P. Currie, Aid.
Section of Hymenoptera: W. H. Ashmead, in charge.
Section of Myriapoda: O. F. Cook, Custodian.
Section of Diptera: D. W. Coquillett, Custodian.
Section of Coleopterous Larvæ: E. A. Schwarz, Custodian.
Section of Lepidoptera: Harrison G. Dyar, Custodian.

DEPARTMENT OF BIOLOGY—Continued.

- (g) *Division of Marine Invertebrates*: Richard Rathbun, Honorary Curator; J. E. Benedict, First Assistant Curator; M. J. Rathbun, Second Assistant Curator.

Section of Helminthological Collections; C. W. Stiles, Custodian.

- (h) *Division of Comparative Anatomy*: Frederic A. Lucas, Curator.

- (i) *Division of Plants (National Herbarium)*: Frederick V. Coville, Honorary Curator; J. N. Rose, Assistant Curator; C. L. Pollard, Assistant Curator; O. F. Cook, Assistant Curator; Miss Carrie Harrison, Aid.

Section of Forestry: B. E. Fernow, Honorary Curator.

Section of Algæ: W. T. Swingle, Custodian.

Section of Lower Fungi: D. G. Fairchild, Custodian.

Associates in Zoology (Honorary): Theodore N. Gill, C. Hart Merriam, R. E. C. Stearns.

DEPARTMENT OF GEOLOGY:

George P. Merrill, Head Curator.

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- (b) *Division of Mineralogy*: F. W. Clarke, Honorary Curator; Wirt Tassin, Assistant Curator; L. T. Chamberlain, Honorary Custodian of Gems and Precious Stones.

- (c) *Division of Stratigraphic Paleontology*: Charles D. Walcott, Honorary Curator; Charles Schuchert, Assistant Curator.

Section of Vertebrate Fossils: O. C. Marsh, Honorary Curator; F. A. Lucas, Acting Assistant Curator.

Section of Invertebrate Fossils: Paleozoic, Charles Schuchert, Custodian; Mesozoic, T. W. Stanton, Custodian; Cenozoic, W. H. Dall, Associate Curator.

Section of Paleobotany: Lester F. Ward, Associate Curator; F. H. Knowlton, Custodian of Mesozoic Plants; David White, Custodian of Paleozoic Plants.

Associate in Paleontology (Honorary): Charles A. White.

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APPENDIX II.

LIST OF ACCESSIONS DURING THE YEAR ENDING JUNE 30, 1898.

[All accessions marked "N" and "O" indicate material obtained primarily for exhibition at the Nashville and Omaha expositions, respectively.]

- ABEL, J. C., Lancaster, Pa.: Stone implements from the banks of the Susquehanna River, near Turkey Hill, Pennsylvania (32510); hammer stones, pestles, grooved axes, arrow and spearheads found on the Conestoga Hills, near Lancaster (32545, 33082); hammer stones, rude notched implements, grooved ax, arrow and spearheads (33626).
- ABBOTT, Miss MOLLIE, Vineland, N. J.: Nine plants. 33729.
- ABBOTT, W. H., Washington, D. C.: Sword cane from New Orleans, two-barreled pistol, probably of German make, from Muskegon, Ill., and a baton. Loan. 33282.
- ABBOTT, Dr. WILLIAM L., Bombay, India: Five hundred and sixty-nine birds' skins, 61 birds' eggs, 13 birds' nests, reptiles, ethnological objects, insects, mammal skins, skulls, skeletons of mammals, reptiles, and birds, and worms from Trong, Lower Siam (32376); 78 mammal skins, 17 alcoholic mammals, 75 birds' skins, skeletons, insects, ethnological objects, and 8 lizards in alcohol from Ladak and Kashmir (33299).
- ADAMS, C. C., Urbana, Ill.: Eight specimens of *Brachynemurus 4-punctatus* Currie (sp. nov.), from Phoenix, Ariz. 33494.
- ADAMS, Prof. F. D. (See under Interior Department, U. S. Geological Survey.)
- ADAMS, HERBERT, New York City: Plaster model of statue of the late Prof. Joseph Henry. 33682.
- ADLER, Dr. CYRUS, Smithsonian Institution: Pair of Syrian sandals. 32928.
- AGRICULTURE, DEPARTMENT OF, Hon. James Wilson, Secretary: Land shells collected in Mexico by E. W. Nelson (32677); three beetles and a grasshopper (32691); land shells collected by E. A. Nelson in Mexico, and fresh-water shells collected by Vernon Bailey in Washington (32752); crustaceans from Mexico collected by E. W. Nelson (32756); phyllopod crustaceans from California collected by Vernon Bailey (32821); crustaceans and leeches, fishes, shells, insects, reptiles, and batrachians collected by Professor Swingle and H. I. Webber in Florida (32829); pupa of *Dynastes tityus* (32899); guano of an insect-eating animal (32932); fresh-water shrimp from Mexico, and two crayfishes from Oregon and Virginia (33063); 944 specimens of *Coccinellidæ* collected by A. Koebel in Australia, China, Formosa, Japan, Hawaii, and Mexico (33079); small collection of fishes made by E. W. Nelson in Mexico in 1897 (33093); specimens of *Livoneca californica*, a fish parasite (33139); land and fresh-water shells from Mexico, and marine shells from Bermuda (33439); land and fresh-water shells from Mexico (33632).
- Material deposited in the National Herbarium:* Specimen of *Nandinia domestica* (32371); specimen of *Napoleona imperialis* (32394); 47 western plants (32435); 1,800 plants collected by G. R. Vasey in Washington (32503); 63 plants collected by W. M. Canby and J. N. Rose in Virginia (32511); 59

AGRICULTURE, DEPARTMENT OF—Cont'd.

Material deposited in the National Herbarium—Continued.

plants from the Straits of Magellan (32562); 4 plants (32695); 600 plants (32738); specimen of *Euphorbia* (32810); 30 specimens of plants from New Mexico and Texas collected by J. K. Metcalfe (32827); 581 plants from Alaska collected in 1897 by W. H. Evans (32909); 28 specimens of Juncaceæ collected by Aven Nelson, Laramie, Wyo. (32944); specimen of *Isoteles* obtained by Prof. William Trelease at Como, Azores (32956); 7 plants collected by O. Metcalf in New Mexico (33000); 5 specimens of plants collected in Washington (33009); 55 specimens of dried plants (33012); plant collected by Prof. J. W. Toumey in Tucson, Ariz. (33013); 3 plants collected by C. V. Piper at Pullman, Wash. (33021); specimen of *Cinnamomum camphora* Nees and Eberm, collected by Dr. E. Teller at Nicholson, Miss. (33043); specimen of *Stapelia variegata* L., sent by N. Wolverton, Marshall, Tex. (33042); 9 plants collected by Dr. Peyton Turner, Navasota, Tex. (33066); 2 specimens of dried plants from Llano, Tex. (33067); 2 specimens of dried plants from Prof. H. Ness, of College Station, Tex. (33090); 2 specimens of Clematis, received from Dr. A. Gattinger, Nashville, Tenn. (33124); specimen of *Bumelia lanuginosa*, received from C. D. Beadle, Biltmore, N. C. (33128); 7 plants collected by F. F. Crevecoeur, Onaga, Kans. (33132); 638 plants collected by Robert M. Horner in southeast Washington (33199); 564 plants from Washington collected by E. P. Sheldon in 1897 (33200); plants collected by Walter H. Evans in Alaska (33232); 10 specimens of Juncaceæ and Cyperaceæ, collected in Washington by F. H. Lamb (33337); 183 plants collected in Mexico by Dr. E. Palmer (33434); 30 plants collected in Wyoming and South Dakota (33638); 11 specimens of dried plants collected in Nevada by Vernon Bailey (33712). (See under Mrs. R. M. Austin; C. D. Beadle; Berlin, Germany, Royal Botanical Museum; F. F. Crevecoeur;

AGRICULTURE, DEPARTMENT OF—Cont'd.

Material deposited in the National Herbarium—Continued.

Prof. W. G. Farlow; C. Forkert; Benjamin Heritage; James S. Hine; George B. King; J. H. Lovell; L. H. Pammel; R. H. Price; Dr. W. W. Rowlee; C. S. Sargent; R. S. Williams; J. Medley Wood; Rev. J. L. Zabriskie.)

AIKEN, C. E., Colorado Springs, Colo.: Two type specimens of *Leucosticta atrata* and *Centronyx ochrocephalus*. Purchase. 33105.

AINSWORTH, E. E. Seattle Fish Company. (See under J. O. Cates.)

ALBANY MUSEUM. (See under Grahams-town, South Africa.)

ALDRICH, Hon. T. H., Birmingham, Ala.: Unios from Alabama, representing 3 species. 32916.

ALEXANDER, E. P., Greytown, Nicaragua. Snake from Nicaragua (32788); seeds supposed to be an antidote for snake bites, reptiles, and batrachians (33083); bat and 7 snakes (33344); plant (33606).

ALGER, Gen. R. A. (See under War Department, U. S.)

ALLEN, C. A., San Geronimo, Cal.: Seventy-one birds' skins from California. Purchase. 33054.

ALLEN, CLARENCE GALE, Washington, D. C.: Framed portrait of Prof. Leonard D. Gale, associated with Prof. S. F. B. Morse in the University of the City of New York in connection with his work on telegraphy. 33541.

ALLEN, Dr. HARRISON (deceased): Skeleton of a young sperm whale. 33148.

ALLEN, JAMES W., Ophir, Mont.: Fossil shell. 32518.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, New York City, transmitted by R. W. Pope: Seeley dynamo; Davenport motor; an old-style and a new-style badge of the American Institute of Electrical Engineers. Deposit. 33438.

AMERICAN MUSEUM OF NATURAL HISTORY, New York City: Five reptiles from Bisbee, Ariz., belonging to the Lumholtz collection. 33158.

ANDREWS, Mrs. GEORGE, Knoxville, Tenn.: Living unios, representing 21

- ANDREWS, Mrs. GEORGE—Continued.
species (32639); living Unios, representing 12 species from the Holston River, Tennessee (32662); 2 living unios, from Knoxville (32718).
- ANDRUS, FRED., Elkton, Oreg.: Land shells, representing 2 species, from Elkton. 33259.
- ANTHONY, A. W., San Diego, Cal.: Larval eel (gift) (32546); 7 specimens of fishes, representing 2 species, shells, birds in alcohol (gift) (32682); reptiles, crustaceans (purchase) (32853); transmitted by F. M. Chapman: 2 petrels, including typespecimen of a new species (deposit) (32905); transmitted by Dr. W. L. Ralph: 2 specimens of Shearwater in first plumage (gift) (32963); nest of *Troglodytes tanneri* from Clarion Island (gift) (32974); 17 birds' eggs from islands near Lower California (gift) (33056); 250 plants collected in Lower California (gift) (33219); 13 eggs of petrels from Lower California (gift) (33345).
- ARMINIUS CHEMICAL COMPANY, Mineral City, Va.: Iron and copper pyrites. 33329.
- ARMSTRONG, E. B., Waterloo, Va.: Loon (*Gavia immer*) in the flesh, from Virginia. 33566.
- ARNHEIM, J. S., San Francisco, Cal.: Land, fresh-water, and marine shells from the western coast of North America. 33227.
- ASHE, W. W., Raleigh, N. C.: Orchid, (gift) (32571); 321 plants (exchange) (33630).
- ASHMUN, Rev. E. H., Albuquerque, N. Mex.: Landshells from Colorado, New Mexico, and vicinity (32630); shells (32786); land and fresh-water shells, representing 17 species (33118); 5 specimens of pupas from Arizona and New Mexico (one new to the collection) (33595); land and fresh-water shells, representing 12 species, from New Mexico (33660).
- ASKEW, H. G., Austin, Tex.: Living unios from Texas (32538); 20 specimens of living unios, representing 5 species from the Sabine River (32548); unios from Texas (32838); living unios, from Texas, representing 5 species (32581); Unionidae, representing 2 species (33065); unios from Texas (33169).
- ATTWATER, H. P., San Antonio, Tex.: Fourteen birds' eggs and one nest from Texas (33156); nest and 3 spotted eggs of Black-throated sparrow, from Texas (33556).
- AUSTIN, Mrs. R. M., Quincy, Cal.: Five hundred plants (purchase) (32676); plant collected at Eureka Mills, Plumas County, Cal. (gift) (33327), (transmitted through Department of Agriculture); 1,037 specimens of plants collected in California (33713).
- BABCOCK, W. B., Washington, D. C.: Specimen of *Sphaerophthalma occidentalis* L.
- BADIE, MARTIN V. D., U. S. Army, transmitted by Charles Parker, hospital steward, Fort Robinson, Nebr.: Specimen of *Thalassa atrata* Fabr. 32520.
- BAER, Dr. H., Charleston, S. C.: Plant. 33140.
- BAILEY, VERNON. (See under Agriculture, Department of.)
- BAILEY, W. S., Waterville, Me.: Six specimens of aporhyolites from Vinal Haven, Me. 33535.
- BAIRD, Miss LUCY H. (See under Smithsonian Institution.)
- BAKER, Prof. CARL F., Alabama Polytechnic Institute, Auburn, Ala.: Diptera, representing 80 species (32685); 11 insects (32324); 237 specimens of *Jasidæ* (33245).
- BALIN, C. S., jr., Breaux Bridge, La.: Butterfly, fossil wood, and sample of clay. 33694.
- BANGS, OUTRAM, Boston, Mass.: One hundred and seventy birds' skins from Santa Marta Mountains, Colombia (33498); 2 birds from Santa Marta (33722).
- BARBER, A. W., General Land Office, Interior Department, Washington, D. C.: Sandstone concretion and fossil bones from North Dakota (33265); 4 specimens of *Helix* sp. from White River, Bad Lands (33281); skin of Badger (*Taxidea americana*) (33563); Long-billed Curlew, *Numenius longirostris*, from South Dakota (33572).
- BARLOW, C., Santa Clara, Cal.: Nine birds' skins. 32404.
- BARNES, HAMLIN, Wellsville, O.: Broken arrowheads and spearheads, illustrating the method of restoration. 32979.

- BARNUM, Lieut. M. H., U. S. Army, Fort Assinniboine, Mont.: Wood rat, *Neotoma cinerea*. 32816.
- BARRETT, O. W., Clarendon, Vt.: Diptera from Mexico (32993); 57 specimens of Mexican lepidoptera (33078); collection of insects from Mexico (33168); Mexican coleoptera (33224); 27 specimens of Mexican diptera (33310); small collection of Mexican diptera (33440).
- BARTSCH, PAUL, U. S. National Museum: Specimen of Brunnich's Murre, *Uria lomvia*, from the Potomac River, near Washington (32400); 28 shrikes and redpolls (exchange) (32580); 2 snakes from Virginia (32719); 3 salamanders from Virginia (32799); 15 podurids (33335); 2 frogs from Glen Sligo, Maryland (33624).
- BATES, GEORGE L., Benito, West Africa: Collection of mammal skins and skulls. Purchase. 33492.
- BATTER, JOHN D., London, England: Chromosylograph: "Eve" (Japanese). Presented to the Smithsonian Institution and deposited in the National Museum. 32331.
- BAXTER, R. T., Fishkill, N. Y.: Specimen of *Photuris pennsylvanica* De Geer. 33204.
- BEADLE, C. D., Biltmore, N. C., through Department of Agriculture. Plants (gift) (32372); plants (exchange) (33389); (exchange) (33570). (See under Agriculture, Department of.)
- BEADLE, H. M., Washington, D. C.: Copper ore from near Linden, Va. 32563.
- BEAN, Dr. TARLETON H., New York Aquarium, New York City: Threespecimens of Silversides, from Water Mill, Long Island (33187); specimens of *Elagatis bipinnulatus*; *Polydaetylus octonemus*; *Scomber pneumatophorus*; hybrid trout, *S. fario* x *S. fontinalis*; crustaceans (33577); specimen of *Venus mercenaria* (33644).
- BECK, Dr. G. VON. (See under Vienna, Austria: K. K. Naturhistorisches Hofmuseum, Botanische Abtheilung.)
- BECK, R. H., Berryessa, Cal.: Five birds' skins from islands near California. 33603.
- BECKETT, W. H., Woodbury, N. J.: Rude leaf-shaped implements and arrowheads found in Gloucester County, N. J. 33391.
- BECKWITH, PAUL, U. S. National Museum: Badge of first lieutenant of the Union Veteran Corps (32939); pocket clock (33041); souvenir gilt medal struck by the Omaha Exposition Company (33727).
- BELL, ALEXANDER G., Washington, D. C.: Phonograph; 40 pieces of telegraphic apparatus; 19 pieces of induction balance apparatus; an audiometer; 20 pieces of photographic apparatus. 33721.
- BELL, Hon. JOHN C., House of Representatives: Ten photographs of rock inscriptions, from Colorado Valley. 33018.
- BENEDICT, A. L., Buffalo, N. Y.: Twenty archæological objects, consisting of arrowheads, fragments of bone, and pottery from a kitchen-midden near Buffalo. 33610.
- BENEDICT, J. E., U. S. National Museum: Two salamanders from Nashville, Tenn. 32973.
- BENEDICT, J. E., jr., Woodside, Md.: Snakes and salamanders (33395, 33444).
- BENGULAT, HADJI EPHRAIM, San Francisco, Cal.: Silver pointer for Pentateuch, seventeenth century, Morocco; manuscript of Book of Esther in a silver case, Fez, Morocco; washbowl and pitcher of Turkish gilt work used at the Passover; piece of tapestry "Golden Calf" sixteenth century, Spanish; "Judgment of Solomon," "French petit point" tapestry, seventeenth century. Deposit. 33164.
- BENJAMIN, Dr. MARCUS, U. S. National Museum: Badge of a Judge of Awards, Tennessee Centennial Exposition (33029); small glass lamp for burning whale oil, from Ware, Mass. (33086).
- BENJAMIN, Mrs. MARCUS, Washington, D. C.: Badge and button of the Union Veteran Union, and of the Sons of Veterans. 32833.
- BENTLEY, W. A., Nashville, Vt.: One hundred photographs of snow crystals. Purchase. 33452.
- BERLIN, GERMANY: KÖNIGLICHES BOTANISCHES MUSEUM, transmitted by Division of Botany, Department of Agriculture: Sixteen specimens of dried plants from various localities in the Old World. 33001.

- BERNADOU, Lieut. J. B., U. S. Navy: Two-handed sword, ancient Chinese or Korean. Deposit. 32730.
- BETTIS, R. L., Sebesta, Tex.: Specimen of *Balaninus obtusus* Blanchard. 32665.
- BEYER, Dr. GEORGE E., Tulane University, New Orleans, La.: Stone idol (Maya) from Costa Rica. 33681.
- BREYMER and HARTLEY, Rockyford, Colo.: Specimen of fossil rock (purchase) (33661); specimens of fossils (gift) (33683).
- BIBBINS, Prof. ARTHUR, Woman's College, Baltimore, Md., received through Interior Department, U. S. Geological Survey: Fossil plant from the Peach Bottom slates, Harford County, Md. 33611.
- BIEDERMAN, C. R., Goldhill, Oreg.: Specimens of serpentine from Rogue River Mountains, near Goldhill (32664); scorpion (*Scorpiops boreus* Girard) (32854); specimen of *Lepidocaris clarkii* Boissduval (33533).
- BILTMORE HERBARIUM, Biltmore, N. C.: Three specimens of *Hicoria glabra villosa*. 32927.
- BISHOP, JAMES N., Plainville, Conn.: Two plants. 33250.
- BIXBY, M., Salt Lake City, Utah: Specimen of wood opal from Idaho. Purchase. "O" 33551.
- BLANKINSHIP, J. W., Cambridge, Mass.: Three hundred botanical specimens from Indian Territory and Oklahoma. Purchase. 32970.
- BLUNT, TAYLOR W., Alexandria, Va.: Specimen of "Tuckahoe"—Indian bread. 32440.
- BOGUE, E. E., Stillwater, Okla.: Acorns from *Quercus macrocarpa* (32900); specimen of *Canavalia* (33552).
- BOLTON, A. L., Palo Alto, Cal., transmitted through the Bureau of Ethnology: Two well preserved skeletons of "Digger" Indians. 33283.
- BOLTON, Dr. H. CARRINGTON, Washington, D. C.: Engraving of Joseph Priestley (gift) (33095); cane from Malacca, with black horn top, once the property of Joseph Priestley (deposit) (33141).
- BOND, L. W., Port Henry, N. Y.: Sixty-two slabs of Cambrian sandstone with tracks of *Climacichnites*. Purchase. 32903.
- BOURKE, Capt. J. G., U. S. Army (deceased), transmitted through Mrs. Mary T. Bourke, Omaha, Nebr.: Collection of ethnological objects. 33332.
- BOURKE, Mrs. MARY T. (See under Capt. J. G. Bourke.)
- BOWERS, STEPHEN, Los Angeles, Cal.: Insects from San Nicolas Island. 32598.
- BOYLE, P. C., Oil City, Pa.: Astral lamp from Quebec, Canada. 32652.
- BRADLEY, A. C., Newport, N. H.: Two specimens of *Homoglossa carnosus*. 33366.
- BRAENDLE, FRED. J., Washington, D. C.: Specimens of *Monarda fistulosa* (32322, 32358); 8 plants (32531); 14 plants (32553, 33671); land and fresh-water shells from Alabama (33734).
- BRANDEGEE, Mrs. KATHARINE, San Diego, Cal.: Three specimens of Cacti (gift) (33044); plant. (33521.) Exchange.
- BRANDEGEE, T. S., San Diego, Cal.: Plant. Exchange. 33433. (See under Interior Department, U. S. Geological Survey.)
- BRATLEY, J. H., Lower Cut Meat Creek Indian School, Rosebud, S. Dak., received through Bureau of Ethnology: Saddle made by Sioux Indians. 33315.
- BREBNER, CHARLES, Newberry, Mich.: Two photographs representing stone images and an inscribed table, the original of which was found near Newberry. 32978.
- BRENIG, G. M., New Milford, Conn.: Rose quartz from Southford, Conn. 32982.
- BRETHERTON, B. J., Newport, Oreg.: Specimen of *Pachycheilus rudis* Stimpson. 32861.
- BRETON, Miss ADELA, Bath, England: Thirty-eight small terra-cotta heads, statuettes, spindle-whorls, etc., from Metepec, near Toluca, Mexico. 33176.
- BRETTON, F. L., Oakland, Cal.: Land snails from California, representing two species, and a specimen of *Fusus* from Monterey. 32717.
- BRIDWELL, ARTHUR, Baldwin, Kans.: Specimen of *Nucula anadontoides* Meek; specimen of *Nuculana bellistriata* Stevens; specimen of *Edmondia aspenvalensis* Meek; 3 specimens of *Bellerophon stevensanus* McChesny; specimen of *Meekella striatocostata* Cox; nodule with undetermined fossil, from the Upper Carboniferous of Douglas County, Kans. 32328.

- BRIGGS, Dr. A. A., East Andover, N. H.: Four plants. 33737.
- BRIMLEY, C. S., Raleigh, N. C.: Twelve moths (32472); larvæ of wingless female of *Phengodes laticollis* Leconte (32667);
- BRIMLEY, H. H. and C. S., Raleigh, N. C.: Skin and skull of Florida mole, *Scalops aquaticus australis* (gift) (32604); 4 skins and skulls of mammals (purchase) (33275); 4 snakes and 3 salamanders from Mississippi (purchase) (33127); reptiles (purchase, "O") (33405); catfish, *Schilbeoides furiosus*, from Crabtree Creek (gift) (32438); Musk Turtle, *Aromchelys odonata*, from Florida (gift) (33513); terrapins from North Carolina and Florida (gift) (33609); mink (purchase) (33571); skin and skull of a Florida Mole (*Scalops aquaticus australis*) (gift) (32711).
- BRITTS, Dr. J. M., Clinton, Mo.: Fresh-water shells from Clinton, representing 9 species (32904); land and fresh-water shells (33039).
- BRODNAX, Dr. B. H., Brodnax, La.: Medicinal plants (32480, 33569).
- BROOKDALE MUSEUM OF NATURAL HISTORY, received through Charles F. Newell, president, West Newbury, Mass.: Twenty-three birds' skins from Egypt. 33573.
- BROOKE, Mrs. H. C., Lexington, Va.: Land and fresh-water shells from Lexington, Va. 33393.
- BROOKE, Mrs. JOHN M., Lexington, Va.: Specimens of *Pemphigus aceritola* found on maple trees. 32726.
- BROOKER, CHARLES F. (See under Coe Brass Manufacturing Company.)
- BROOKS, ALFRED H. (See under Professor Alfred Lacroix.)
- BROWN, CHARLES F., Hot Springs, Ark.: Specimen of bauxite from Pulaski County, Ark., and specimen of quartz from Saline County, Ark. 33112.
- BROWN, EDWARD J., Lemon City, Fla.: Seven birds' skins. 32349.
- BROWN, H. E., Sisson, Cal.: Two specimens of Umbelliferae (gift) (32707); 227 plants (purchase) (32591); 239 plants from California (purchase) (33304).
- BROWN, Mrs. N. M., Ashtabula, Ohio: Nine hundred Mexican plants collected by E. W. Nelson (32380); 965 Mexican plants (32878). Purchase.
- BRUNER, Prof. L., Lincoln, Nebr.: Nine specimens of *Schistocerca paranense* Bruner, from Argentina, South America. 32918.
- BUCHANAN, CHARLES MILTON, Tulalip Indian Agency, Tulalip, Wash.: Edible bulb belonging to the genus *Sagittaria* (33374); 2 specimens of *Urtica* collected at the Tulalip Indian Agency (33656).
- BUCK, Dr. D. S., Lepanto, Ark.: Pottery vessel with two chambers connected by a Y-shaped neck, from a cemetery mound near Lepanto. Purchase. 33226.
- BULL, CHARLES P., jr., Ojus, Fla.: Snake. 33445.
- BURGESSER, C. C., York, Pa.: Elm-tree leaves affected with the elm-tree beetle. 32483.
- BURKHART, Rev. N., Baltimore, Md.: Fossil coral from Dorchester County, Md. 33268.
- BURNS, FRANK. (See under Interior Department, U. S. Geological Survey.)
- BUSH, B. F., Courtney, Mo.: One hundred and twenty-nine plants collected in southern swamps (33350); 337 plants (33402). Purchase.
- BUTLER, Mrs. MARY, Rockford, Wash.: Picture made by a Coeur d'Alene Indian. 33119.
- BUTLER, ROBERT, Forsyth, Mont.: Skull and fore feet of *Claosaurus*, from the Cretaceous near Forsyth. Purchase. 33376.
- BUTLER, WALTER, Chicago, Ill.: Larva of sawfly, *Cimbex americana*. 32516.
- BUTTON, FRED, Oakland, Cal.: Land and marine shells from California, representing 11 species. 33051.
- BUYSSON, M. le Marquis, HENRI DU, Brout-Vernet (Allier), France: One hundred and fifty-two examples of Scolybidæ, representing 27 species, and 3 parasites. 32494. Exchange.
- CAHN, LAZARD, New York City: Specimen of thaumasite from West Patterson, N. J., and a specimen of pollucite from Mount Mica, Paris, Me. (gift) (33316); 10 specimens of minerals (purchase) "O" (33336); minerals (purchase) "O" (33380).
- CALCUTTA, INDIA, Indian Museum, transmitted by Mr. Frank Finn: Specimens of birds in alcohol. Exchange. 32731.

- CALL, R. ELLSWORTH, Lawrenceburg, Ind.: Minerals, reptiles, insects, crustaceans, mollusks, specimens of blind fish, specimens of *Myotis lucifugus* from Mammoth Cave, Kentucky. 33228.
- CAMMANN, B. H., Empire City, Oreg.: Fossil porpoise skull. Purchase. 33386.
- CANBY, WILLIAM M., Wilmington, Del.: Plant from Vancouver Island, British Columbia (33137); 273 plants collected in the northwestern part of America (33284). Exchange. (See under Agriculture, Department of.)
- CANDLIN, H., Kerrville, Tex.: Turtle and two snakes from Texas. 33613.
- CANTWELL, GEORGE G., Howcan, Alaska: Twenty-two birds' skins from Alaska, bird's egg. 32414.
- CARINTHIA, AUSTRIA, Die Freie Vereinigung Tiroler Botaniker, Dellach Oberdranthale (transmitted by Hans Simmer, secretary): One hundred and eighty-six plants collected in Austria and other localities. Exchange. 33174.
- CARNEGIE MUSEUM, Pittsburg, Pa. (transmitted by Herbert H. Smith, curator): Unionidæ from Pennsylvania, representing 28 species. 33062.
- CARNSE, S. P., Port Angeles, Wash.: Butterfly. 32396.
- CARPENDER, J. NEILSON, jr., New York City: One hundred and thirteen specimens, representing 54 species of Trenton formation fossils, from Baffin Land. 32959.
- CARPENTER, FRANK G., Washington, D. C.: Twelve prints illustrating the destruction of missionaries. 33251.
- CARRICO, E. T., Stithton, Ky.: Archaeological objects found in Salt River bottom, near Stithton (32776); rudely chipped flint implements and arrowheads from Hardin County, Ky. (33188).
- CARRIGER, HENRY W., Sonoma, Cal.: Specimen of *Parus rufescens* from California. 32596.
- CARUR, G. W., Tuskegee, Ala.: Medicinal plants. 33568.
- CATES, J. O., Port Townsend, Wash., received through Seattle Fish Company, E. E. Ainsworth: Specimen of *Acrotus willoughbyi*. Purchase. 33369.
- CATLEY, H., Syracuse, N. Y.: Lady-bird beetle, *Coccinella bipunctata* Linn. (33307); beetle (33733).
- CAWSTON AND COCKBURN, South Pasadena, Cal.: Skin of an ostrich. Purchase. 33293.
- CERAMIC ART COMPANY, Trenton, N. J.: Loving cup. Purchase. 32887.
- CHAMBERLAIN, DR. L. T., New York City: Living unios from Alabama (32773); living unios from Alabama, to be added to the "Lea Collection" (33123); Unionidæ (33183); living unios from Alabama (33240); unios from Alabama, representing 2 species (33252); 2 specimens of living Unionidæ from Japan (33527). Presented to the Smithsonian Institution and deposited in the National Museum.
- CHAPMAN, F. M. (See under A. W. Anthony.)
- CHAPMAN, GEORGE W., Cawker City, Kans.: Specimen of paint rock (gift) (33161); 2 septarian nodules from Kansas (exchange) (33547).
- CHINANFU, CHINA, Chinanfu Museum: Collection of Chinese medicines. Collected by Rev. V. F. Partch. Exchange. 32931.
- CHINANFU MUSEUM. (See under Chinanfu, China.)
- CHITTENDEN, F. H., Department of Agriculture: Pupa of *Dynastes tityus*. 32899.
- CHRISTIE, MILLER, Chelmsford, England: Photograph of a Hawaiian feather cloak. 32995.
- CHRISTMAS, J. M., Croome Station, Md.: Tooth of a fossil shark. 32814.
- CHURCHILL, WILLIAM: War club from Samoa. 33454.
- CLAPP, G. H., Pittsburg, Pa.: Land and fresh-water shells, and Unionidæ (32541, 32582, 32653, 33163).
- CLAPP, MAJ. WILLIAM H., Washington, D. C.: Tooth of a mastodon. 32801.
- CLARK, REV. AARON B., Rosebud, S. Dak.: Photograph of Sioux Indian women. 33314.
- CLARK, DR. C. K., Kingston, Ontario, received through William Palmer: Pair of shrikes from Ontario; (33585); prairie horned lark from Ontario. (33680.)
- CLARK, PRENTIS, Berea, Ohio, transmitted by G. H. Girty, U. S. Geological Survey: Seven specimens of Carboniferous invertebrates, and 8 specimens of Lower Carboniferous fossil plants from northern Ohio. 32823.

- CLARK, SANDA, Washington, D. C.: Two skins of *Fiber zibethicus*. Purchase. 33201.
- CLARK, Dr. WILLIAM, Berea, Ohio, transmitted by George H. Girty, U. S. Geological Survey: Fish spine found in Berea shales, and a lamellibranch from Cleveland shale. 32770.
- CLEVELAND, D., San Diego, Cal.: Four specimens of *Frankenia palmeri*. 33561.
- CLEVELAND, Dr. W. N., Toledo, Ohio: Typo specimens of *Echinognathus clevelandi* Walcott, and Utica shale fossils from near Holland Patent, New York. 33447.
- COCKERELL, Prof. T. D. A. (See under New Mexico Agricultural Experiment Station.)
- COE BRASS MANUFACTURING COMPANY, Ansonia, Conn., transmitted by Charles F. Brooker, president: The Wallace collection of dynamos and electrical machinery. 32363.
- COHEN, Rev. HENRY, Galveston, Tex.: Copy of Jubilee Liturgy, in Hebrew, Marathi, and English, of the synagogue at Bombay. 32757.
- COIT, J. C., Denton, Tex.: Ammonite found in Denton County, Tex. 33472.
- COLE, Mrs., Washington, D. C.: Shuttle for weaving rag carpet. 33516.
- COLLAMARINI, Dr. G., Naples, Italy: Specimens of selenium. Purchase. 32921.
- COLLINS, F. S., Malden, Mass.: Fifty-two plants (33008); fascicle of plants (Phycotheca Boreali-Americana No. 8). (33008). Purchase.
- COLLINS, G. N.: Photograph of the Golah tribes of Africa playing the game "Mancala." 33145. (See under New York Colonization Society.)
- COLONIZATION SOCIETY, Washington, D. C.: Five hats from Liberia, Africa, illustrating twined and coiled weaving. 33539.
- COLT, J. B., & Co., New York City: Six transparencies illustrating animal locomotion. Purchase. 33415.
- COMMONS, A., Wilmington, Del.: Five specimens of *Ophioglossum vulgatum* L. 32907.
- COMSTOCK, F. M., Cleveland, Ohio: Plants. Exchange. 33507.
- COOK, Mrs. ALICE, Washington, D. C.: One hundred plants from the Canary Islands. Purchase. 33460.
- COOK, H. L., Front Royal, Va.: Sphinx moth, *Protoparce rustica* Fabr. 32461.
- COOK, Prof. O. F., Washington, D. C.: Two lily bulbs from Africa (gift) (32635); 24 beetles from Paguna, Tenerife (gift) (32884); 506 plants collected by F. C. Straub in Liberia (gift) (33110); more than 5,000 specimens of *Myxomycetes*, constituting Professor Cook's private collection (purchase) (33125); 23 vials containing African mollusks (gift) (33295); 3 bats and a specimen of *Crocodura* from Mount Coffee, Liberia, West Africa (gift) (33400); 156 plants (gift) (33432); specimen of *Cycloderma hubbardi* Cook (type) and a type and 5 cotypes of *Desmonus earlei* Cook (gift) (33496). (See also under New York Colonization Society.)
- COOKE, Dr. CLINTON T., Hutchinson, Minn.: Fourteen birds' eggs from Minnesota. 33096.
- COOKE, Miss J. M., San Diego, Cal.: Shells, representing 67 species, from Lower California and the Gulf of California (gift) (32775); specimens of west-coast shells (exchange) (33526).
- COOKE, M. P. B., Lockport, N. Y.: Nest of oriole. 32868.
- COOPER, W. B., U. S. National Museum: Silver watch with detached lever or anchor escapement. 33309.
- COOVER, A. B., Roxabell, Ohio: Photograph of a carved stone found at Baum Village, Ross County, Ohio. 33165.
- COQUILLETT, D. W., Department of Agriculture: Seven hundred and eighty-two specimens of North American diptera and 28 specimens of European diptera, including several type specimens (32830); 487 specimens of diptera (32915); marmoset, *Hapale jacchus* (33253).
- CORDLEY, A. B., Corvallis, Oreg.: Thirty-seven specimens of diptera. 32841.
- CORNELL, Mrs. THOMAS L., Derby, Conn.: Twelve specimens of Etruscan pottery. Exchange. 33303.
- CORNING, Dr. G. A., Hampton, Iowa: Eight specimens of dried plants collected in Iowa and Wisconsin. 33351.

- COSBY, L. J., Cuckoo, Va.: Four hundred and forty-two archæological objects from Louisa County, Va. 33514.
- COSTA RICA, INSTITUTO-FISICO-GEOGRAFICO DE COSTA RICA, San José, Costa Rica, transmitted by H. Pittier, director: Ten specimens (representing 3 species) of fresh-water crabs. 32399.
- COUBEAUX, EUGENE, St. Louis de Laurierin, Saskatchewan, Canada, Northwest Territory: Two birds' skins (exchange) (32384); 16 birds' skins from northwestern Canada (exchange) (33081); 5 birds' skins (gift) 33697; 5 birds' eggs and a bird's nest (gift) (33679).
- COURTIS, W. M., Detroit, Mich., received through G. Heinemann: Fourteen fragments of pottery and 6 rude flint arrowheads found 12 feet below the surface near Yorkville, Ga. (32420); celestite from Put-in-Bay Island, Lake Erie, Ottawa County, Ohio (33555).
- COVILLE, F. V., Department of Agriculture: one thousand three hundred and sixty-nine herbarium specimens (32320); plant (32693); 34 specimens of *Hepatica* collected previous to and in 1890 (32948).
- COWLES, CALVIN J., Wilkesboro, N. C.: Specimen of flexible sandstone from "Bending Rock Mountain," North Carolina. 32777.
- COX, LISBON A., Keokuk, Iowa: Twelve fish spines, and 126 teeth of fishes from the Keokuk group near Keokuk, Iowa. One geode with millerite. Purchase. "O." 33429.
- COX, PHILIP, Chatham, New Brunswick, Canada: Two specimens of Killifish, *Fundulus diaphanus*. 32564.
- COX, W. V., U. S. National Museum: Engraved print of Don M. Dickinson. 33540. (See under Yan Foo Lee.)
- COXE, Hon. MACGRAUE, Southfields, N. Y.: Four plants. 32634.
- CRAIN, W. E., Tacoma, Wash.: Five photographs of whales. Purchase. 33360.
- CRAWFORD, Dr. J. D., Philadelphia, Pa.: Plants. 33637.
- CREVECŒUR, F. F., Auburn, Ala.: Ninety-two insects from Alabama, Colorado, Arizona, and Mexico (32409); 50 specimens of lepidoptera (32410); 185 insects (32491); 151 insects (32828);
- CREVECŒUR, F. F.—Continued.
transmitted through Department of Agriculture: 40 specimens of lepidoptera, 103 of hymenoptera, and 11 of coleoptera (32864); 230 specimens of hymenoptera, coleoptera, and diptera, etc. (33270); 14 specimens of hymenoptera and other insects (33361). (See under Agriculture, Department of.)
- CROCKETT, JAMES, Irish Lane, Pa., (received through Bureau of Ethnology): Spade-like natural formation (33510); stone pestle (33730).
- CROSBY, F. W., Naples, Italy: Geological material from Sweden (purchase) (32602); geological material from Norway and Sweden (purchase) (32760); basaltic columns from Bennan, near Asbach, Rhenish Russia (gift) (33126).
- CROSS, Miss FLORA, Millport, N. Y.: Clear wing sphingid, *Hemaris diffinis* Boisd. 32517.
- CULIN, STEWART, University of Pennsylvania, Philadelphia, Pa.: Head of bone foreshaft and copper-barbed head of a sea-otter harpoon from Kadiak. (Returned.) 33034.
- CUMMINGS, Miss C. E., Wellesley, Mass.: Sixty-one lichens (32826); 44 lichens (33647). Exchange.
- CURRIE, ROLLA P., National Museum: Ethnological and natural-history specimens from Mount Coffee, Liberia. (Collected for the National Museum.) 32601.
- CURRIER, Rev. C. W. Necker, Md. Sixteen arrowheads and spearheads from Belmont County, Maryland. 32997.
- CURTISS, A. H., Jacksonville, Fla.: Six roots of *Tradescantia* (gift) (32615); 93 dried plants (purchase) (33210); 139 plants collected in Florida and 25 species of Algae (purchase) (33349).
- CUSICK, WILLIAM C., Union, Oreg.: Ten plants collected in Oregon (gift) (33115); 199 plants from Oregon (purchase) (33374).
- CUZNER, A. T., Gilmore, Fla.: Plant. 33372.
- DAGGETT, Governor JOHN, 32659, San Francisco, Cal.: Basket in process of being woven (32659); 4 photographs of Klamath River Indians (32747); 16 photographs of Klamath, Trinity River, and Hoopa Indians (33160).
- DALE, T. NELSON. (See under W. N. Irwin.)

- DALL, W. H., U. S. Geological Survey: Marine shells from Coos Bay, Oregon, representing 10 species. 32895.
- DANIEL, Dr. Z. T., Browning, Mont.: Wood carving made by a Piegan Indian boy (32657); butterfly from the Rocky Mountains of Montana (32684); Indian food, obtained from a Blackfoot Indian of Montana (33458).
- DANIELS, L. E., Brookton, Ind.: Living Unionidæ (32431); living Unionidæ, representing 10 species, from the Wabash River (32498); living Unionidæ, representing 3 species (32874); living Unionidæ (32936); 5 nodules (10 specimens) of Mazou Creek animal remains (33354).
- DAUGHTERS OF THE AMERICAN REVOLUTION, transmitted by Mrs. Eleanor Holmes Lindsay, Washington, D. C.: Two-dollar bill, issue of 1776, Maryland, photograph of Nancy Cloes Ray, autograph letter of Sarah A. Exton. 32443.
- DAVIS, HOMER S., Rosa, Idaho: Bone from the gills of a large chub. 33701.
- DAVIS, M. C., Portland, Oreg.: Double-barreled rifle hidden in the lava beds by Captain Jack during the Modoc war. 32648.
- DAVIS, WILLIAM T., New Brighton, N. Y., received through C. L. Marlatt: Cynipid galls representing 3 species. 33538.
- DAY, A. E., Beirut, Syria: Sixty-seven specimens of lepidoptera. 32643.
- DELGADO, EULAGIO. (See under Lima, Peru, Sociedad Geografica.
- DETROIT MUSEUM OF ART, Detroit, Mich., transmitted by H. E. Sargent: Twenty-three species of shells, fresh-water and marine. 32466.
- DEYROLLE, EMILE, Paris, France. Models of plants. Purchase. 33394.
- DIAL, Mrs. M. B., San Luis Obispo, Cal.: Land and marine shells from California, representing 18 species. 33615.
- DICKHAUT, H. E., U. S. National Museum: Specimen of *Epeira trifolium* Hentz. 32729.
- DILL, HARRY P., Port Hope, Ontario, Canada: Unfinished Indian arrow-head. 32408.
- DILLER, J. S. (See under Interior Department, U. S. Geological Survey.
- DISSTON, HENRY & SONS, Philadelphia, Pa.: Seventeen saws manufactured by Messrs. Disston & Sons. "O." 33413.
- DODGE, BYRON E., Richfield, Mich.: Collection of archaeological objects from Greene County, Mich., human skull from a mound in Lapeer County; and a polished hatchet from Germany. Deposit. 33493.
- DOGGETT, J. OTTO, Piedmont, S. C.: Hammer stones, polished hatchet, grooved ax, drilled ceremonial object, and arrow or spearheads from Greenville County, S. C. (33437), minerals (33476).
- DOLLFUS, ADRIEN, Charron, Paris, France: Five specimens of *Zenobia prismatica*. 32852.
- DOREMUS, C. A. (See under Henri Moissan.)
- DOUGLAS, J., New York City: Apache arrow. 33098.
- DRAKE, C. M., Tacoma, Wash.: Six starfishes representing 4 species, from Puget Sound, Washington (exchange) (32302); shell of *Physa* from California (gift) (32701); specimens of Miocene fossils from Eel River, California (gift) (33162); specimens of *Asterias brevispina* Stimpson and *Asterias ochracea* Brandt (gift) (33503); starfish, sea-urchin, and 2 snails (33715).
- DRAKE, Mrs. C. M., Tacoma, Wash.: Land, fresh-water, and marine shells. 32312.
- DRAKE, N. F., Nampa, Idaho, transmitted by W. Lindgren: Stone pestle from near Snake River. 32972.
- DRAPER COMPANY, Hopedale, Mass.: Four spindles, 4 shuttles, and 2 photographs of looms. 33404.
- DREW, Prof. GILMAN, Johns Hopkins University, Baltimore, Md.: Marine mollusks, representing 3 species. 33515.
- DUBLE, J. C., Williamsport, Pa.: Specimen of *Thomisus aleatorius*. 32512.
- DU BOIS, RHESA GRIFFIN, Washington, D. C.: Basket and photograph, to be exhibited with the Horton basket machine. 33049.
- DUBOIS, Dr. EUGENE, The Hague, Holland: Plaster cast of the skull of a specimen of *Pithecanthropus erectus*. 32865.
- DUCKWORTH, A. S., Poplar Bluff, Mo.: Specimen of *Habenaria paramana*. 32572.

- DUGÈS, Dr. A., Guanajuato, Mexico: Cincture made from the inner bark of a tree (gift) (32656); 4 plants (gift) (32806); specimen of *Crotalus poly-stictus* (exchange) (32988); 3 birds' skins (gift) (33028); 12 plants (gift) (33136).
- DUNN, M., Burlington, Iowa: Sixty-two specimens of Burlington group fossils. Purchase. "O." 33353.
- DUNTON, J. J. (See under Treasury Department, U. S. Life-Saving Station.)
- DURGUS, G. B., Nasbie, Va.: Geological specimens. 33716.
- DURY, CHARLES, Cincinnati Society of Natural History, Cincinnati, Ohio: Specimen of *Eudeuma undulata* Welsh, new to the Museum collection; three specimens of aculeate hymenoptera. 33722.
- DUVALL, G. S. and F. F., Conaways, Md.: Chipped and partly polished hatchet and 64 arrowheads from Anne Arundel County. 33714.
- DUVALL, H. C., Washington, D. C.: Paint stone, found in a quarry workshop, in Pulaaki County, Ill. 32429.
- DYER, E. G., Warren, Ohio, transmitted by David White, U. S. Geological Survey: Three specimens of *Arthraria barbata* and one specimen containing trails, from Squaw Creek, near Girard, Ohio (32851); 153 specimens of hymenoptera (32728); 150 specimens of diptera (32749); 150 of lepidoptera, principally new to the collection (32881).
- EAKLE, A. S., Washington, D. C.: Geological material from Tyrol. Exchange. 33557.
- EARLE, Mrs. ALICE MORSE, Brooklyn, N. Y.: Four photographs of tape-looms. Exchange. 33649.
- EARNEST, JOHN PAUL, Washington, D. C.: Brick supposed to have been taken from the foundation of the house where George Washington was born. 33247.
- EATON, B., Department of Agriculture: Four plants. 33373.
- ECKELS, Rev. C. E., Petchaburee, Siam: Two Siamese tracts written by a native (33277); 106 ethnological objects from Siam (33477).
- ECKSTEIN, W. C., Washington, D. C.: Specimen of *Cucullæa gigantea* Conrad, from the Eocene formation at Fort Washington, Md. 32393.
- EDMAN, J. A., transmitted by H. W. Turner: Specimen of *Loftusia columbiana* Dawson. 33190.
- EDWARDS, H. S., Sparta, Ga.: Specimen of *Chauliodes pectinicornis*. 33719.
- EDWARDS, S. M., Argusville, N. Dak.: Thirteen specimens of unios, representing 7 species, from Argusville. 32479.
- EGGLESTON, W. W., Rutland, Vt., received through F. H. Knowlton: Thirty-three plants. 33580.
- EIGENMANN, Dr. C. H., Bloomington, Ind.: Three specimens of *Amblyopsis spelæus*. 33243.
- ELERICK, W. L., Cannonsburg, Mich.: Larva of *Eristalis tenax* Linn. 32611.
- ELY, T. N. (See under Pennsylvania Railroad Company.)
- ENGLISH, GEORGE L., & Co., New York City: Minerals. "O." (33341); ores and minerals. "O." (33398). Purchase.
- ENOS, Mrs. ANNA F., Saratoga, N. Y.: Specimens of Maple-tree Pemphigid, *Pemphigus acericola* Riley. 32336.
- EVANS, W. H. (See under Agriculture, Department of.)
- EVERETT, JAMES J., National Military Home, Kans.: Spore-cases of one of the lower cryptogams, *Marsilia* sp. 32723.
- EYRE, M. K. (See under General Electric Company.)
- FAIRCHILD, D. G., Department of Agriculture: Collection of Javanese insects. 33677.
- FALL, Prof. H. C., Pasadena, Cal.: Six specimens of *Pheidole hyatti* Emery; new to the collection. 33481.
- FARLOW, Dr. W. G., Cambridge, Mass., transmitted through the Department of Agriculture: Eleven specimens of fungi. 33151.
- FAXON, Dr. WALTER. (See under Museum of Comparative Zoology, Cambridge, Mass.)
- FAY, J. A., & Co., Cincinnati, Ohio: Five cuts of planing machines. "O." 33525.
- FEATHERSTONAUGH, Dr. THOMAS, Washington, D. C.: Human skull from New Mexico. 33617.
- FELDEN, Colonel, Wells, Norfolk, England: Six plants representing the flora of Nova Zembla. 32795.
- FERNALD, Prof. H. T., State College, Pa. Parasites. 32342.

- FERNALD, M. L., Gray Herbarium, Botanic Garden, Cambridge, Mass.: Fifteen specimens of *Antennaria*. 33628.
- FERRISS, J. H., Joliet, Ill.: Living Unionids, representing 2 species (gift) (32627); living specimens of *Margaritana* from the Kankakee River, Illinois (gift) (32742); land shells from Tennessee (exchange) (32792); fresh-water shells, representing 25 species, from the eastern United States (gift) (32837); land shells, representing 2 species, from Illinois (gift) (33614).
- FEWKES, Dr. J. WALTER, Washington, D. C.: Twenty-five dolls illustrating the symbolism of Zuni gods (33194); 13 "breath feathers," naqua kwoci of the Soyaluna Ceremony; 4 Soyaluna pabos, obtained from the Mokis, Walpi, Arizona (33689). (See also under A. F. Potter.)
- FIEGE, WILFRED A., Dragoon, Ariz.: Blood-sucking Cone-nose, *Conorhinus sanquiusuga* Leconte. 32889.
- FIELD COLUMBIAN MUSEUM, transmitted by W. H. Holmes, Chicago, Ill.: Ethnological objects and a miscellaneous collection of archaeological objects from Mexico and South America. Pottery and bronze objects from an Etruscan tomb (32689); 811 specimens of plants from Yucatan, collected by C. F. Millepaugh. (32737.) Exchange.
- FIGGINS, J. D., Kensington, Md.: Turtle (gift) (32309); 85 birds' skins from Greenland (purchase) (32708); skins and skull of a Greenland hare, *Lepus gronlandica* (purchase) (33592).
- FINN, FRANK. (See under Calcutta, India: Indian Museum.)
- FISH COMMISSION, U. S., Hon. J. J. Brice, Commissioner: Marine invertebrates, fishes, mollusks, insects (32348); marine shells and mollusks representing 4 species (32607); crabs (*Portunus sayi* and *Planes minutus*) from Vineyard Sound (32672); types and cotypes of fishes collected in the North Pacific Ocean, Bering Sea, Oregon, Florida, and New York (32960); fishes from Florida, Virginia, and Louisiana, (32992); type specimens of four new species of fishes collected by the steamer *Albatross* in 1896 and 1897 (33011); Stilt, *Himantopus mexicanus*, from Texas (33428); transmitted by the Leland

FISH COMMISSION, U. S.—Continued.

- Stanford Junior University, Stanford University, California: type specimen of *Oligoplites mundus* from San Juan Lagoon, Mexico, collected by steamer *Albatross* (33459); specimen of *Caulolepis longidens* from the Pacific Ocean, collected by the steamer *Albatross* (33490); type specimens of *Averuncus sterletus* and *Radulinus boleoides* collected in the North Pacific Ocean by the U. S. Fish Commission steamer *Albatross* (33502); fresh-water shells collected by Dr. C. H. Gilbert while in the service of the Fish Commission in Oregon and California (33534); type specimens of *Notropis chamberlaini* and *Notropis louisianæ*; four cotypes of *Notropis chamberlaini* (33658).
- FISHER, H. L., Stockton, N. J.: Specimens of *Paeocus venosus* (32427); larvæ and imago of *Epilachna borealis* Fabr. (32482.)
- FISHER, WILLIAM H., Baltimore, Md.: Photograph of double nest of a Chipping Sparrow from Talbot County, Md. 32794.
- FITCH, Mrs. CLARA, Sault Ste. Marie, Mich.: Photograph of a stone object found near Sault Ste. Marie. 32468.
- FLEMING, J. H., Toronto, Ontario, Canada: Eleven birds' skins from Canada. 32418.
- FLINT, Dr. JAMES M., U. S. Navy: Leather pocket-book, the property of the grandfather of Dr. Flint (Daniel Flint of Hillsboro, N. H.), containing 47 coins. 32406.
- FLORIDA TIMES-UNION AND CITIZEN, received through G. W. Wilson, Jacksonville, Fla.: Spotted Snake Eel, *Ophichthys guttifer*, from Nassau Sound. 33463.
- FLOYD, FRENCH, Washington, D. C.: Specimen of Horned Grebe, *Colymbus auritus*. 33167.
- FLYNT, FRANK, General Land Office, Washington, D. C.: Pottery head found about one-half mile from the McIntosh trail from Indian Springs to Alabama, 6 miles northwest from Griffin, Ga. 33408.
- FOOTE, Dr. A. E., Philadelphia, Pa.: Specimen of roebbingite, from Franklin, N. J. (33607); specimen of mineral (33731). Purchase.

- FOOTE, WARREN M., Philadelphia, Pa.: Minerals. Purchase. "O." 33368.
- FORD, JOHN, Philadelphia, Pa.: Land shells from the Bahama Islands, representing 2 species. 33292.
- FORESTIER, J., keeper of Saluria lighthouse, Matagorda Island, Tex., received through Hon. J. D. Mitchell: Deformed claw of a specimen of *Callinectes sapidus* from Espiritu Santo Bay, Texas. 33653.
- FORKERT, C., transmitted by Department of Agriculture: Seven specimens of plants from Mississippi. 33711.
- FOWKE, GERARD. (See under Smithsonian Institution, Bureau of Ethnology.)
- FRANKLIN INSTITUTE, Philadelphia, Pa., transmitted by H. Heyl, actuary: Two bronze medals of the institute. 32919.
- FREDHOLM, A., Baltimore, Md.: Three hundred and twenty-nine plants collected in Jamaica in 1897. 33171.
- Freie Vereinigung Tiroler Botaniker [Die]. (See under Carinthia, Austria.)
- FRIC, V., Prague, Bohemia: Specimen of hessite on quartz. Purchase. "O." 33443.
- FRIEL, F. W., Victoria, Tex.: Seven arrowheads. 33430.
- FRIERSON, L. S., Frierson's Mill, La.: Three specimens of unios (gift) (32540); unios, representing 2 species, from Logansport, La. (gift) (32843); unios from the Sabine River (gift) (32767); 2 specimens of unios (gift) (33064); 6 specimens of Tertiary fossils (exchange) (33267).
- FRIESS, Dr. H., Innsbruck, Austria: Nine hundred and seventy-four specimens of bees. Exchange. 32869.
- FROBENIUS, Dr. L., Swiss Museum of Ethnology and Archaeology, Basel, Switzerland: Archaeological objects from Swiss lake dwellings. Exchange. 32763.
- FUCHS, Dr. Theo. (See under Vienna, Austria: K. K. Naturhistorisches Hofmuseum, Botanische Abtheilung.)
- FULTZ, Prof. F. M., Washington, Iowa: Four hundred and fifty specimens of Burlington crinoids. Purchase. "O." 33465.
- FURLONG, E. B., Livingston, Ariz.: Modern Turkish "spiel-pfennig," found in ruins in the Sierra Ancha Mountains, Arizona. 32493.
- FURNESS, Dr. W. H., Philadelphia, Pa.: Thirty birds' skins; turtle skeleton; mammal skins from Borneo. 32415.
- FUR SEAL COMMISSION, U. S.: Fur seal (32745); transmitted by Leland Stanford Junior University: bones of mammoth and bear (33382).
- GAILLARD, Mous. FELIX., Morbihan, France: Fac simile of a sculptured sign on a dolmen near Carnac, France. 32445.
- GANE, HENRY S., Chicago, Ill., received through Bureau of Ethnology: Stone hatchet and a sock made of turkey feathers. Purchase. "O." 33483.
- GARNER, EDWARD, Quincy, Cal.: Eleven butterflies (gift) (32457); skin and skull of chipmunk, *Tamias quadrimaculatus* Gray (exchange) (32678); 20 birds' skins from California (exchange) (32803); 5 birds' skins from California, and 3 mammal skins from California (gift) (32961).
- GATLING GUN COMPANY, Hartford, Conn.: Photograph of a Gatling gun; also photographs of a Gatling gun mounted on a tripod. 33518.
- GATTINGER, Dr. A. (See under Agriculture, Department of.)
- GEDDIS, THOMAS R. T., Bassett, Nebr.: Specimen of *Monohammus confusor* Kirby, and Crab-spider, *Xysticus limbatulus* Keyserling. 32732.
- GEIGER, Dr. G. B., Manning, S. C.: Specimen of *Sus scrofa domesticus*. 32527.
- GENERAL ELECTRIC COMPANY, Schenectady, New York: Nineteen specimens of porcelain, and 15 pieces of insulated wires (gift) (33184); 18 pieces of electrical apparatus (deposit) (33185). Transmitted through M. K. Eyre, manager, lamp works, Harrison, New Jersey: Twenty-seven incandescent lamps (gift) (33407). Transmitted through S. D. Greene: Edison bi-polar dynamo, originally used in the steamer *Columbia*, 1878 (gift) (33703).
- GENOA, ITALY: Museo Civico di Storia Naturale, Genoa, Italy, transmitted by Dr. R. Gestro: Alcoholic specimen of *Heterocephalus glaber*, from Somaliland, Africa. Exchange. 32890.
- GEOLOGISCH-PALAEONTOLOGISCHES INSTITUT. (See under Munich, Germany.)

- GEOLOGICAL SOCIETY OF LONDON. (See under London, England.)
- GESTRO, DR. R. (See under Genoa, Italy, Museo Civico di Storia Naturale.)
- GETMAN, DR. A. A., Chaumont, N. Y.: Specimen of *Lituites undatus* Conrad (33291); trilobite, *Illænus crassicaudus americanus* Billings, from the Trenton formation (33387); 3 specimens of Trenton cryolites (33593); 3 trilobites from the Trenton formation (33697).
- GILBERT, MRS. A., Plainfield, N. J.: Larvæ of the Hickory Saw-fly, *Selandria caryæ* Norton. 32316.
- GILBERT, B. D., Clayville, N. Y.: Ferns from Bermuda. 33554.
- GILBERT, DR. C. H. (See under U. S. Fish Commission; Leland Stanford Junior University.)
- GILBERT, PROF. G. K., U. S. Geological Survey: Unionidæ from Erie Canal, New York. 33699. (See also under Interior Department, U. S. Geological Survey.)
- GILLMORE, R., Creston, Iowa: Sphinx-moth. 32499.
- GIRTY, G. H. (See under Prentis Clark; Dr. William Clark; Thomas Piwonka.)
- GLATFELTER, N. M., St. Louis, Mo.: Ten specimens of willows (gift) (32783); 26 plants (exchange) (33047).
- GODING, DR. F. W., Rutland, Ill.: Specimen of *Telamona*, representing 4 species, new to the collection (32389); type specimen of *Stethocophyma doranti* Goding (33221).
- GOLDMAN, E. A., Tampico, Mexico: Twenty-five plants collected in Mexico (33091); 140 plants from Mexico (33583); received through Department of Agriculture: 13 plants collected in Mexico (33655). (See under Agriculture, Department of.)
- GOLL, REV. G. P. (See under New York Colonization Society.)
- GOODFELLOW, EDWARD, U. S. National Museum: Atlantic cable signal-key used in telegraphic longitude determinations between Europe and America in 1869-1872. Purchase. 32985.
- GOODRIDGE, F. G., New York City: Trilobite, *Illænus americanus*, from Silliman's Fossil Mount, Baffin Land. 32882.
- GOODYEAR RUBBER COMPANY, Washington, D. C.: Velocipede made about 1870. Purchase. 32807.
- GORDON, R. H., Cumberland, Md.: Six specimens, representing 2 species, of Clinton group brachiopoda, and 18 specimens, representing 2 species, of Niagara group brachiopoda. 32855.
- ORMAN, M. W. (See under Interior Department, U. S. Geological Survey.)
- GOULD, C. N., Winfield, Kans.: Thirty-seven flaked flints, from quarries at Maple City, Kans. 33640.
- GRAHAMSTOWN, SOUTH AFRICA: ALBANY MUSEUM, transmitted by Dr. S. Schönland: Skeleton of an African elephant. Exchange, 33147.
- GRANT, COL. CHARLES COOTE, Hamilton, Ontario, Canada: Box containing 53 specimens of Niagara graptolites and other fossils. 33672.
- GRAVES, C. B., Groton, Conn.: Plants from Connecticut. 32908.
- GRAVES, JAMES A., Susquehanna, Pa.: Specimen of *Hieracium pilosella*. 32458.
- GRAY HERBARIUM, Cambridge, Mass.: Fifty-eight specimens of Mexican plants, and 12 specimens of Mexican Umbelliferae. Exchange. 33506.
- GREATA, LOUIS A., Los Angeles, Cal.: Specimens of *Baria tenella*. 33453.
- GREEN, LYDIA OLIVE, Chicago, Ill.: Two pieces of music written in commemoration of the union of the Blue and the Gray at the unveiling of the Logan monument in Chicago, July 22, 1897. 32369.
- GREENE, PROF. E. L., Catholic University, Washington, D. C.: Specimen of *Viola atlantica* collected in Anne Arundel County, Md. 33605.
- GREENE, S. D. (See under General Electric Company.)
- GREGG, D. K., Fulton, Mo.: Land shells, representing 2 species (32486); 42 specimens of brachiopoda, representing 6 species from the St. Louis formation of Missouri (32644); 35 specimens, representing 19 species of Carboniferous fossils, and 2 specimens of calciferous fossils (32858); 4 specimens of *Seminula* from the Kaskaskia formation (33033).
- GRINDELL, DR. C. S., Baltimore, Md.: Trumpeter pigeon, in the flesh. 33007.
- GRINNELL, JOSEPH, Pasadena, Cal.: Six specimens of *Agelaius* (32315); 3 goldfinches, including a specimen of *Spinus tristis salicamans* (32506); type specimen of kinglet, representing a new

GRINNELL, JOSEPH—Continued.

subspecies (32507); 6 birds' skins (32524); specimen of Vigor's Wren *Thryothorus b. spilurus* from California (33157); 7 birds' skins from California, including type of a new subspecies of rock wren (33181); 6 birds' skins, including a type of *Harporhynchus redivivus pasadenensis* from California (33450).

GROSS, H. L. W., Alexandria, Tenn.: Specimen of *Sphaerophthalma occidentalis* L. 32533.

GROSSE, HERRMAN, Paraguay, Republic of Paraguay: Thirteen beetles. 32628.

DE GROSSOUVRE, M. A., Bourges (Cher), France: Cast of type specimen of *Schlüteria lurteti*. Exchange. 33276.

GUMP, H. D., Johnson City, Tenn.: Indian hatchet from Johnson County, Tenn. Purchase. 33543.

HABIGHURST, C. B., Las Cruces, N. Mex.: Specimen of gypsum from near Tularosa. 33378.

HACKNEY, W. H., Glenna Ferry, Idaho: Two teeth of a fossil bison. 33120.

HAGGARD, Dr. J. B., Parsons, Tenn.: Specimen of *Caryocinus ornatus*. 33529.

HALL, B. H., Washington, D. C.: Kearney cross. 32849.

HALL, Mrs. CHARLES CUTHBERT, Westport Point, Mass.: Abnormal specimen of *Botrychium ternatum*. 32489.

HALL, H. M., Riverside, Cal.: One hundred and sixty-five plants obtained principally from San Jacinto Mountains, California. Purchase. 32875.

HAMBURG, DAVID T., London, England: Collection of photographs taken in Central Asia. 32840.

HAMILTON, JAMES M., received through Dr. R. W. Shufeldt, of Takoma Park, D. C.: Eight specimens representing new species of *Holospira* from Rio

HAMILTON, JAMES M.—Continued.

Grande Mountains, Brewster County, Tex. (32393); 9 fossils from the Comanche series of Texas, and a chipped flint knife (32741); specimen of *Euonide bartonioides* (33068); transmitted by T. W. Stanton; flint spearhead of Apache origin, found at Semiside Spring, Chisos Mountains, Foley County, Tex. (33203).

HANCOCK, G. R., cadet, U. S. Military Academy, West Point, N. Y.: Collection of personal relics of the late Gen. Winfield S. Hancock, U. S. Army. Deposit. 32876.

HANHAM, A. W., Winnipeg, Manitoba, Canada; Fifty-two specimens of microlepidoptera, mostly new to the Museum collection (33077); collection of microlepidoptera (33257).

HANSEN, GEORGE, Berkeley, Cal.: Sixteen specimens of *Junci*. 32957.

HARDING, JOHN H., Washington, D. C.: Snake. 33545.

HARLAN, H. H. (See under Harris, I. H., estate of.)

HARPER, THOMAS. (See under Western Pennsylvania Historical Society.)

HARRIES, GEORGE, Hankow, China, received through Miss E. R. Scidmore: Two bricks of tea made for the Tibetan trade. 33455.

HARRINGTON, RAYMOND, Mount Vernon, N. Y.: Arrowheads, scrapers, etc., of quartz and quartzite, found in the District of Columbia. 32333.

HARRIS, ISAAC, Georgetown, D. C.: Harmoni flute. Purchase. 33286.

HARRIS, ISRAEL H., estate of, transmitted by the administrators, H. H. Harlan and R. F. Mosher, Waynesville, Ohio: Seventy-five boxes containing the "I. H. Harris Collection" of fossils and archaeological objects, consisting of about 20,000 specimens.¹ 33149.

¹ Mr. Charles Schuchert, of the National Museum, was detailed to make an examination of the collection before its transfer to Washington. Upon the completion of his work he addressed the following letter to the administrators:

Messrs. R. F. MOSHER and H. H. HARLAN,
Administrators of the I. H. Harris Estate.

GENTLEMEN: In making a survey of the natural-history specimens belonging to the late Mr. I. H. Harris, of Waynesville, Ohio, consisting of fossils, archaeological specimens, shells, and minerals, about 15,546 specimens were found, as per appended list. The number of specimens here given is not exact, but it appears safe to state that there will be more than that number present when the collection is completely brought together. The total includes the duplicate specimens which Mr. Harris agreed should be exchanged by the U. S. National Museum whenever favorable opportunity offers.

WAYNESVILLE, OHIO, December 29, 1897.

- HARRISON, Miss CARRIE, U. S. National Museum: Three plants. 32573.
- HARRISON, S. R., Clarksburg, W. Va.: Specimen of *Corydalis cornutus*. 32312.
- HART, GEORGE B., Baltimore, Md.: Living pigeon imported from England. 33604.
- HART, W. W. & Co., New York City: Kadiak bear skull. Purchase. 32351.
- HARVARD HERBARIUM, Cambridge, Mass.: Specimen of *Stylosanthes elatior* from Tennessee, and specimen of *Stylosanthes procumbens* from Florida. 32977.
- HASBROUCK, Dr. E. M., Washington, D. C.: Two hundred and eighteen birds' skins from North America (32403); 585 birds' skins from North America (33014). Purchase.
- HASSALL, Dr. ALBERT, Department of Agriculture: Parasites. Deposit. 32341.
- HASSETT, BURDETT, Reliance, Va.: Oven-bird, *Sciurus aurocapillus*, in the flesh. 32549.
- HATCHER, J. B. (See under Smithsonian Institution, Bureau of Ethnology.)
- HAWKINS, ARMAND, New Orleans, La.: Print from a copperplate by Diego de Villegas. 33032.
- HAWKS, A. MCL., Tacoma, Wash.: Photograph of specimens of *Glycimeris generosa* Gld. 32496.
- HAY, Prof. O. P., U. S. National Museum: Eggs of *Amphiuma means* from Arkansas. 33058.
- HAY, Prof. W. P., Washington, D. C.: Specimen of *Necturus* from Cayuga Lake, Ithaca, New York. 33468.
- HEIDEMANN, O., Petworth, D. C.: Six specimens of *Neuroctenus simplex* Uhler. 32637.
- HEINEMANN, G. (See under William M. Courtis.)
- HEINRICHS, W. F., Indianapolis, Ind.: Mole cricket, *Gryllotalpa columbica* Scudder. 32528.
- HELLER, A. A., Minneapolis, Minn.: Three plants (exchange) (32705); 345 plants from New Mexico (purchase) (32796). (See under Minnesota, University of.)
- HENDERSON, JOHN B., jr., Washington, D. C.: Two valves of *Unio duclirci* from Siam, and two unios in alcohol from

The specimens thus obtained in exchange are to be added to the permanent portion of the "I. H. Harris Collection." The number of duplicate specimens, however, can not be given until the entire collection has been studied in Washington.

The following is a list of the specimens in the collection:

	Number of specimens.
Crinoids from the Cincinnati group.....	1,018
Crinoids from Crawfordsville, Ind	860
Crinoids from Burlington, Iowa.....	131
Crinoids from various other localities.....	109
Crinoid slabs from the Cincinnati group.....	50
Agelacrinus and related forms.....	117
Total crinoids.....	2,285
Palmastrer in bank office.....	1
Starfishes in Washington, D. C.....	40
Total starfishes.....	41
Calymene senaria (a trilobite)	888
Other Cincinnati group trilobites	294
Trilobites from other geological horizons.....	84
Total trilobites.....	1,266
Brachiopoda from the Cincinnati group.....	1,200
Brachiopoda from all other geological horizons	169
Gastropoda from the Cincinnati group.....	170
Gastropoda from all other geological horizons	35
Lamellibranchiata from the Cincinnati group	601
Cephalopoda from the Cincinnati group.....	38
Total mollusca.....	2,213
Miscellaneous fossils from the Cincinnati group.....	751
Paleozoic fossils from all horizons other than the Cincinnati group.....	1,416
Secondary and tertiary fossils	254
Total fossils	8,226

- HENDERSON, JOHN B., jr.—Continued.
Europe (32432); specimen of *Fissurella* from Acapulco, Mexico (32834); musical instruments from Pekin, China (33113).
- HENDERSON, L. F., University of Idaho, Moscow, Idaho: Three specimens of a new Aster. 33220.
- HENSHAW, H. W., Hilo, Hawaii: Skin of *Acridotheres tristis* from Hilo, Hawaii (32624); 2 skins of Flycatchers (33621).
- HERITAGE, BENJAMIN, received through Department of Agriculture: Four plants. 32411.
- HERRICK, C. L., Albuquerque, N. Mex.: Plants collected on the Tres Maria Islands and western coast of Mexico. 33305.
- HEYL, Mrs. EMMA L., Washington, D. C.: Dance shirt (ghost dance) and a hoop ("signal"), obtained from the Sioux Indians, South Dakota. 33383.
- HEYL, H. L. (See under Franklin Institute.)
- HEYWARD, W. N., Hardeeville, S. C.: Specimen of *Actias luna* Linn. 32529.
- HIBBARD, D. R., Sturgis, Mich.: Marine shells from New Smyrna, Fla. 33651.
- HICKS, G. H., Department of Agriculture: Specimen of *Polygonum tenue* (32510); 4 plants from the greenhouse of the Department of Agriculture (32568).
- HILDBURGH, L. W., New York City: Seven unmounted prints of objects, consisting of Indian implements, ornaments, etc. 33646.
- HILDEBRAND, A. M., College Station, Tex.: Specimen of *Gutierrezia berlandieri*. 32570.
- HILLS, R. C., U. S. Geological Survey: Four specimens of crustacean trails from the Cretaceous Apishapa formation of southern Colorado. 32364.

Archæological specimens:

Pottery	86
Axes, pestles, and other stone implements	1,147
Spear and arrow points and other flint implements	4,508
Copper pieces	10
Stone pipes	12
Stone mask found at Fort Wayne, Ind.	1
Bone implements from Madisonville, Ohio	100
Total archæological specimens	5,864

Minerals	306
Land and fresh-water shells	650
Marine shells	500
Total shells	1,150

SUMMARY.

Fossils	8,226
Archæological specimens	5,864
Minerals	306
Recent shells	1,150
Total specimens in the "I. H. Harris collection"	15,546

In bequeathing this collection to the U. S. National Museum, Mr. Harris also provided that "my beloved wife, Edith, and my daughters Laura H. Mosher and Minnie Mildred Harris shall have the privilege of selecting from any part of the collection any and all such specimens as they may respectively desire as souvenirs."

In compliance with this provision of the will Mrs. Harris and her daughters, Miss Minnie Mildred Harris and Mrs. Laura H. Mosher have selected the following as souvenirs:

	Specimens.
Minerals	306
Recent shells	1,150
Arrow points from Oregon	100
Other archæological specimens	50
Secondary and Tertiary fossils	250
<i>Calymena callicephala</i> (a trilobite)	100
Paleozoic fossils	250
Total	2,206

Yours respectfully,

CHARLES SCHUCHERT,
For U. S. National Museum.

- HILLYER, GEORGE, Atlanta, Ga.: Specimen of talc from Atlanta mine, Cherokee County, N. C. 33364.
- HINE, Prof. JAMES S., Ohio State University, Columbus, Ohio: Specimens of hymenoptera, diptera, and coleoptera, representing 26 species (33278); transmitted by Department of Agriculture: 4 specimens of *Ceratopogon guttipennis*, and 2 specimens of *Canophanes* sp. New to the collection. (33313.)
- HITCHCOCK, C. H., Hanover, N. H.: Geological material illustrating geological section across New Hampshire and Vermont. Exchange. 33528.
- HOADLEY, Dr. FRANK H.: Sixty-eight birds' skins from Greenland. 33392.
- HODGE, F. W., Bureau of Ethnology: Seven pay orders from Ecuador and an old French bank note. 32397.
- HODGMAN, Rev. S. C., Haines City, Fla.: Specimens of Coccids. 32603.
- HOECH, TH., Washington, D. C.: Four specimens, representing two species, of Isopods from Yokohama, Japan. 32352.
- HOFFMAN, SAMUEL W., Morristown, N. J.: Three photographs of a Persian Astrolabe. 33690.
- HOGAN, EDWARD A., Brooklyn, N. Y.: Beetle (*Alaus oculatus* Linn.). 32317.
- HOLMES, S. J., Woods Hole, Mass.: Hermit crabs (*Pagurus annulipes* Stimpson) (32426); 2 specimens of an Isopod from San Pedro, Cal. (33296).
- HOLMES, Prof. W. H. (See under Field, Columbian Museum.)
- HOLUB, Dr. EMIL, Vienna, Austria: Bohemian Cambrian fossils, collected by Dr. Jaraslaus J. Jahn; birds' eggs and geological material from South Africa. 32736.
- HOLZINGER, Prof. J. M., Winona, Minn.: Taraxacum galls and parasites. 32456.
- HOLZNER, F. X., San Diego, Cal.: Two skeletons of *Carpodacus*. 32488.
- HOOD, LEWIS E., South Boston, Mass.: Small inlaid Turkish dagger from Erzeroum, Armenia; old miniature shell pocketbook, brought from England to America in 1800; old bronze candlestick from northern Spain, brought to the United States in 1876; small arrow-point and other stone implements found in Franklin Park, Boston, Mass., June 5, 1889. 33152.
- HOPPING, RALPH, Kaweah, Cal.: Collection of coleoptera. 33549.
- HORAN, JOSEPH, U. S. National Museum: Two specimens of *Storeria dekayi* from Virginia, collected for the National Museum. 32836.
- HORNER, ROBERT M. (See under Agriculture, Department of.)
- HORTON, W. W., Washington, D. C.: Twelve teeth of fossil shark. 32481.
- HOUGH, Dr. GERRY DE N., New Bedford, Mass.: Fifty specimens of diptera (33522); 50 specimens of diptera including type specimens (33717).
- HOUGH, Dr. WALTER, U. S. National Museum: Twenty-five specimens of Triassic fossils, and 51 specimens of Cretaceous fossils from Arizona (32762); specimen of Poor Will (*Phalaenoptilus*) from Arizona (32785); miscellaneous natural history material, collected in Arizona (32815).
- HOWARD, L. O., Department of Agriculture. Salamander from California. 33706. (See J. M. Stedman.)
- HUBBARD, HENRY G., Detroit, Mich.: Twenty-one specimens of *Ecritotarsus incurvus* Distant, from Phoenix, Ariz. (new to the collection) (32305); 105 specimens of insects from Arizona (32319); 4 specimens of *Lycomorpha latercula* Hy. Edwards (new to the collection) (32333); 121 specimens of hymenoptera from Arizona (32613); 81 beetles from Arizona (32626); 96 specimens of diptera and neuroptera from Arizona and California (32638); 17 specimens of Myrmeleonidae from Arizona (32671); 164 specimens of lepidoptera from Arizona (32746); 115 specimens of insects from Arizona (32831); 51 insects from Arizona (32897); 53 specimens of larvæ and other insects from Arizona (32942); 5 larvæ of *Dinapates wrightii* Horn (new to the collection) (32984); collection of coleoptera of North America, representing about 12,000 species, and constituting the private collection of Messrs. Schwarz and Hubbard (33101); 1,057 specimens of hemiptera from Arizona and California (33248).
- HUBBARD, LUCIUS L., Houghton, Mich.: Two specimens of powellite from Calumet, Mich. Exchange. 32981.

HUBER, WILLIAM. (See under Smithsonian Institution, Bureau of Ethnology.)

HUFFMAN, S. C., Pleasant Lake, Ind.: Larva of *Attacus cecropia* Linn. 32416.

HUGHES, Mrs. S. M., Corpus Christi, Tex.: Specimen of *Heterogamia bolliana* Saussure (32778); beetle (*Eleodes carbonaria* Say), and a caterpillar (*Paripilo cressphontes* Cramer) (32950).

HULST, Dr. GEORGE D., Brooklyn, N. Y.: Types of 42 species of North American Geometridæ. 33384.

HUNTER ROBERT, St. Johns, Newfoundland: Skull of Porpoise (*Phocoena*) from Greenland. 32891.

HUNTER, WILLIAM, National Zoological Park; specimen of *Dryopteris cristata*, (32398); plants (32567, 32700, 32709, 32879, 33130); reptiles and batrachians from Missouri, Illinois, and Indian Territory. 33154.

IHERING, Dr. H. VON, Museu Paulista, São Paulo, Brazil. Shells, representing 41 species, from San Sebastian Island, Brazil. 32768.

IJIMA, Dr. I. (See under Tokyo, Japan, Science College, Imperial University).

ILLINOIS, UNIVERSITY OF, Urbana, Ill. Twelve birds' skins from the East Indies. Exchange. 33340.

INDIAN MUSEUM. (See under Calcutta, India.)

INGERSOLL, J. C., Bowie, Md. Twenty-five shells, bird in alcohol, 10 insects, representing 6 species, 11 reptiles, 85 birds' skins from Honduras. Purchase. 32579.

INGERSOLL-SERGEANT DRILL COMPANY, New York City. Photographs of various types of drills and mountings. "O." 33523.

INLAND PRINTER COMPANY, Chicago, Ill. Specimen of "nature printing." 33338.

INSTITUTO FISICO-GEOGRAFICO DE COSTA RICA. (See under Costa Rica.)

INTERIOR DEPARTMENT:

United States Geological Survey: Four boxes containing rocks and other material from California, Oregon, and Montana (32323); 39 specimens of invertebrate cretaceous fossils and about 24 specimens of plants (32654); 3 slabs of lingulas from the Medina sandstone at Lockport, N. Y., collected by Prof. G. K. Gilbert (32917);

INTERIOR DEPARTMENT—Continued.

United States Geological Survey—Cont'd. arrowheads, chips, flakes, etc., of obsidian found in Inyo County, Cal. (32975); 310 plants collected in Idaho and Montana by J. B. Leiberg (32990); 87 specimens of fossils from the Middle Cambrian (?) Ocell, and Chickamunga limestone of Tennessee, collected by E. O. Ulrich (33004); geological collections representing the Bidwell Bar, Downieville, and Chico quadrangles, collected by H. W. Turner (33010); selected collection of rocks representing the Sonora and Jackson quadrangles in the gold belt of California, collected by H. W. Turner (33040); 33 fossil plants from the San Pablo formation, north of Mount Diablo, Arizona, collected by H. W. Turner (33048); 9 specimens showing spheroidal weathering of shale, from the Cretaceous Shale (Chico), Shasta County, Cal., obtained by J. S. Diller (33108); fossil specimen from the Carboniferous strata of Gordon, Palo Pinto County, Tex., transmitted by Frank Burns (33122); specimen of goniatite; 3 Jurassic insects, 15 Ammonites and a slab of Triassic fishes, obtained from the Nashville Exposition exhibit (33172); geological material from Judith Mountains, Montana, collected by L. V. Pirsson and W. H. Weed (33189); 7 specimens of fulgurite from Telluride quadrangle, Rolling Mountain, Colorado; 2 specimens of telluride from Crested Butte quadrangle, Crested Butte; 4 specimens from the Elk Mountains quadrangle, from Castle Creek (33217); collection of rocks from the Little Rocky Mountains of Montana, assembled by Messrs. Walter H. Weed and L. V. Pirsson (33320); 49 specimens of Canadian rocks, collected by Prof. F. D. Adams, Montreal, Canada (33274); vertebrate and invertebrate fossils from Mississippi, collected by Frank Burns and L. C. Johnson (33318); 26 specimens of Cretaceous invertebrates, collected by L. C. Johnson from the "Tombigbee Sand," near Columbus, Miss. (33326); 285 plants, collected by

INTERIOR DEPARTMENT—Continued.

United States Geological Survey—Cont'd.

- M. W. Gorman in Washington Forest Reserve (33356); 200 plants, collected by T. S. Brandegee in the Teton Forest Reserve (33357); 67 crinoids, 170 shells, 385 shark's teeth, and 38 shark's spines, from the Lower Carboniferous at Quarry, Marshall County, Iowa (purchased by the Museum, on the authority of U. S. Geological Survey, for the Omaha Exposition) (33396); 36 specimens of aegerite syenite from the Judith Mountains, Montana (33401); a suite of rocks, collected and prepared by the Survey under the direction of Mr. J. S. Diller (33403); 562 crinoids from the Kinderhook formation at Quarry, Marshall County, Iowa (purchased from J. McCabe through the Geological Survey, (33417); 20 specimens of fossils (from Omaha Exposition Exhibit) (33668); rocks from Bear Paw Mountains and Judith Mountains, Montana, collected by W. H. Weed (33469). (See under Arthur Bibbins; James F. Kemp; J. E. Olive; R. S. Spence.)
- IRWIN, W. N., Eckington, D. C.: Specimen of an evergreen blackberry (32665); plant (32706); 71 specimens of dike rocks from eastern New York and western Vermont, and 45 thin sections, collected by Prof. T. Nelson Dale (33710).
- JACKSON, VICTORIA, Bowling Green, Ky.: Land shells, representing two species. 33739.
- JAHN, Dr. JARASLAUS J. (See under Dr. Emil Holub.)
- JAMES, FOREST, Grand Mound, Wash.: Longicorn-beetle, *Rosalia funebria* Mots (32417); specimen of *Dasyllis peticata* Say (33676).
- JAMES, I. E., Pittston, Pa.: Earthworms and mud from a coal mine near Pittston (32379); Horn-tailed Sawfly (32508).
- JAMMES, Prof. L., Mazeres, Areige, France: Implements, ornaments of stone, bone, ivory, and shell, and pottery from Cambodia, Indo-China. Purchase. 33074.¹
- JARVIS, P. W., Colonial Bank, Kingston, Jamaica: Two specimens of *Liomera dispar* and *Panopeus* from Jamaica. 32588.
- JENKINS, C. FRANCIS, Washington, D. C.: Collection of chrono-photographic apparatus. Loan. 33057.
- JENKINS, W. D., Tarpon, Tex.: Four specimens of Thread Herring, *Opisthonema oglinum*, and a specimen of Scaled Sardine, *Sardinella pensacola*. 33223.
- JENNE, ELDRED L., Coupeville, Wash.: Land, fresh-water, and marine shells from Washington, representing nine species. 33641.
- JENNEY, W. P., Black Hills, S. Dak.: Specimen of *Viola delphinifolia* from near Deadwood. 33674.
- JEPSON, W. L., University of California, Berkeley, Cal.: Eighteen plants (32704); 27 plants from California (33046).
- JERMY, G. (See under J. G. Smith.)
- JOHN, ANDREW, Washington, D. C.: Snow-snake, Iroquois wooden cradle, board, basket, and a beaded reticule (purchase) (33084); samples of corn and beans raised by the Iroquois Indians (33142); 2 loaves of bread made from Indian corn and boiled beans (33271).
- JOHNSON, A. J., Astoria, Oreg.: Specimens of *Oreobroma tweedyi* (32412); 6 plants (32696).
- JOHNSON, Prof. C. W., Wagner Institute, Philadelphia, Pa.: Type specimens of diptera, representing four species (32560); 7 specimens of hymenoptera (32885).
- JOHNSON, J. L., Duffield, Va.: Nine arrow points, stone ax, a pebble, and a brass button. Exchange. 32326.
- JOHNSON, L. C. (See under Interior Department, U. S. Geological Survey.)
- JOHNSON, W. H., Olaa, Hawaii: Coffee leaves infested with a species of *Aleyrodes*. 32444.
- JOHNSON, WILLIAM H., Wamsley, Ohio: Crab spider, *Acrosoma spinea* Hentz. 32460.
- JOHNSTON, Mrs. ELIZABETH E., Los Angeles, Cal.: Marine shells from San Pedro, Cal., representing 7 species. 33499.

¹This accession was entered in the Museum Report for 1894 as a deposit by Dr. Thomas Wilson.

- JOHNSTON, FRANCES B., Washington, D. C.: Collection of pictorial studies, portraits, etc. Purchase. 33061.
- JOHNSTON, FRANK J., New Carlisle, Ohio: Horse-hair worm. 32353.
- JOHNSTON, Mrs. H. D., Los Angeles, Cal.: Marine shells, representing two species from California. 33643.
- JONES, Prof. A. H., Kansas Wesleyan University, Salina, Kans.: Nine specimens of Cretaceous invertebrates from the Dakota and Mentor beds of Central Kansas. 32702.
- JONES, MARCUS E., Salt Lake City, Utah: One hundred and five plants (exchange) (33030); 536 plants (exchange) (33089); 800 plants (purchase) (33306).
- JORDAN, Dr. D. S. (See under R. C. McGregor.)
- JUDSON, Mrs. ISABELLA FIELD, Dobbs-Ferry-on-Hudson, New York: Seal of Cyrus W. Field, calico mask worn by him in South America, and seven of his autograph letters. Deposit. 32555.
- JUSTI, HERMAN, Nashville, Tenn.: Souvenir badge of "Nashville Day" at the Exposition, 1897. 32996.
- K. K. NATURHISTORISCHES HOEMUSEUM, Botanische Abtheilung. (See under Vienna, Austria.)
- KANE, Miss, Washington, D. C.: Crayfish, *Cambarus propinquus* Girard. 33511.
- KANSAS, STATE UNIVERSITY OF, Lawrence, Kans., transmitted through Prof. I. W. Williston: Fossil bones representing the genera *Clidastes*, *Tylosaurus*, and *Platycarpus* (purchase), "O." (33487); 2 boxes Carboniferous shale with crinoids (exchange) (33488).
- KEARNEY, T. H., jr., Washington, D. C.: Two hundred and seventy-seven plants from Tennessee (purchase) (32910); 61 plants from Washington, D. C. (gift) (33208); 42 plants (33738).
- KEATLEY, J. H., Washington, D. C.: Eight carved-horn spoons from Alaska, and an ivory carving of a bird's head (33437); totem carvings in black slate from Alaska (33170, 33482). Purchase.
- KEILEY, JOSEPH T., New York City: Forty-seven Indian relics from North Carolina and Tennessee. 33216.
- KELKER, WILLIAM A., Harrisburg, Pa., transmitted by the Bureau of Ethnology: Clay model of a boat-shaped object found in Harrisburg. 32866.
- KELLY, HARRY M., Cornell College, Mount Vernon, Iowa: Specimen of living unio (32797); specimens of *Unio tuberculatus* from Illinois (33687).
- KELSEY, F. W., San Diego, Cal.: Marine shells from California and Japan, representing 50 species. 33574.
- KEMP, Prof. JAMES F., New York City, transmitted by the U. S. Geological Survey: Geological material from New York. 32316.
- KENT SCIENTIFIC INSTITUTE, received through C. A. Whittemore, Grand Rapids, Mich.: Specimen of *Bassaricyon gabbii* (for remounting in exchange for specimens). 33099.
- KETCHAM, Mrs. L. A., Mount Pleasant, D. C.: Hurdy-Gurdy, owned by the Ketcham family for seventy-five years. 32522.
- KIMBLE, G. W., Placerville, Cal., received through H. W. Turner: Two specimens of Ammonites. 33673.
- KINCAID, TREVOR, University of Washington, Seattle, Wash.: Shells from Alaska, representing about 60 species. 32883.
- KING, Dr. C. L., Jacksonville, Fla.: Two tomato caterpillars with parasitic cocoons; spider. 32459.
- KING, GEORGE B., Lawrence, Mass., received through Department of Agriculture. Types of two new species of ants, *Pheidole townsendi* André, and *Pheidole kingi* André, from Mexico (new to the Museum collection). 33339.
- KING, W. H., Langdon, D. C.: Ferns collected in 1876 and 1885 at St. Helena, Cape Town, Africa, islands in the Indian Ocean, Madagascar and Brazil. 32971.
- KINGMAN, C. C., Reading, Mass.: Specimen of *Salix bebbiana* (33581); 8 specimens of violets (33020).
- KINGSLEY, Prof. J. S., Tufts College, Mass.: Three specimens of Shrimp (*Caradina pasadenae* Kingsley) from Pasadena, Cal. 32356.
- KINGSTON, JAMAICA, Institute of Jamaica: Seven specimens of crustaceans. 33100.
- KIRKLAND, Dr. R. J., Grand Rapids, Mich.: Living unios from Michigan (32539); living unio from Grand Rapids, representing one species (32633); unio from Georgia (32765); unios from Alabama (32964).

- KIRKPATRICK, J. A., Sparta, Ill.: Specimen of Pleistocene coniferous fossil wood found in a coal bank about 80 feet below the surface. 32987.
- KIRSCH, Dr. P. H., Phoenix, Ariz.: Shell of *Pyramidula strigosa* (32471); specimens of *Epiphyragnophora* from Catalina Island, California (32679); 10 specimens of Lower and Upper Silurian fossils from Mount Franklin (33464).
- KISHINOUE, K., Imperial Fisheries Bureau, Tokyo, Japan: Type specimen of *Chrysaora gilberti* Kishinouye, from California. Exchange. 33244.
- KIZER, Dr. D. T., Clinton, Mo.: Land and fresh-water shells from Clinton, representing 7 species. 33027.
- KLAGES, EDWARD A., Grafton, Pa.: Pine-tree lizard. 32608.
- KNOWLES, C. J. A., Tampa, Fla.: Specimen of *Castalia flava*. 32955.
- KNOWLTON, F. H., U. S. Geological Survey: Thirty plants. 33698. (See under W. W. Eggleston.)
- KNOWLTON, W. J., Boston, Mass.: Specimen of calcite and galena from Joplin, Mo. (32360); gem (32587). Purchase.
- KORBELE, A. (See under Agriculture, Department of.)
- KÖNIGLICHES BOTANISCHES MUSEUM. (See under Berlin, Germany.)
- KRAUSS, ALFRED, U. S. consular agent, Zittau, Saxony, Germany: Nineteen specimens of Mesozoic European fossils, and 33 geological specimens. 33285.
- KRUEGER, P. W., Cleveland, Ohio: Insects. 33332.
- LACOE, R. D., Pittston, Pa.: Seventy-two mounted microscopic sections of Carboniferous fossil plants from the lower coal measures of Great Britain (33196); 15 boxes containing a collection of fossils (33678); 38 specimens of fossils from Peru, South America (33696).
- LACROIX, Prof. ALFRED, Paris, France, received through Alfred H. Brooks, U. S. Geological Survey: Minerals. 33365.
- LAMB, F. H. (See under Agriculture, Department of.)
- LAMBIE, J. B., Washington, D. C.: Tools to complete a special series for exhibition at the Omaha Exposition. Purchase. 33414.
- LANDVOIGT, EDWARD, Washington, D. C.: Specimen of Red Phalarope, *Crymophi-*
- LANDVOIGHT, EDWARD—Continued.
lus fulicarius, from Potomac River. 32713.
- LANGDON, AMANDA, Canaan, Conn.: Specimen of *Sphinx carolina* L. 32986.
- LANGSHAW, J. P., New Bedford, Mass.: Stone pestles, gouges, hatchets, and arrow heads. 32454.
- LAZIER, Dr. A. M., Morgantown, W. Va.: Unfinished banner stone. 32790.
- LEE, HARRY A., Denver, Colo.: Ores from Colorado. Exchange. 33319.
- LEE, J. W., Baltimore, Md.: Specimen of zoisite and thulite in albite, from Wight's gneiss quarry, Stony Run, North Baltimore, Md. 32307.
- LEE, THOMAS, Washington, D. C.: Thirteen ethnological objects from Alaska and Arizona (33019); specimen of Shoveler, *Spatula clypeata* (33451). (See also under Smithsonian Institution.)
- LEIBERG, J. B. (See under Interior Department, U. S. Geological Survey.)
- LELAND STANFORD JUNIOR UNIVERSITY, Stanford University, Cal., received through Prof. C. H. Gilbert. Cotype of *Rimicola muscarum* from Monterey Bay, also type of *Oligopilites mundus*. 33421. Exchange. (See under Fish Commission, U. S., and Fur Seal Commission.)
- LEMMON, J. G., North Temescal, Cal.: Specimen of *Podistera nevadensis*. 33582.
- LETSON, Miss JENNIE E., Buffalo, N. Y.: Seven specimens of living unios from Buffalo, N. Y. 32537.
- LIMA, PERU: Sociedad Geografica: transmitted by Enladio Delgado: Miscellaneous collection of insects from the Valley of the Pichis and the Perene, central Peru, 2,000 to 3,000 feet altitude. 32362.
- LINDGREN, W. (See under N. F. Drake).
- LINDSAY, MRS. WILLIAM. (See under Daughters of American Revolution).
- LINK, E. S. Jefferson City, Mo.: Specimen of moss. 32724.
- LINTNER, Prof. J. L., Albany, N. Y.: Specimens of *Lasius interjectus* Mayr. 32629.
- LOCHMAN, C. L., Bethlehem, Pa.: Forty-two photographs of medicinal plants. Purchase. 33600.
- LONDON, ENGLAND: Geological Society of. Seven specimens of fossil coral. Exchange. 33598.
- LONG, Hon. JOHN D. (See under Navy Department).

- LONG, SAMUEL S., York Pa.: Stone disc from Havana,, Mason County, Ill. 32690.
- LOOMIS, Rev. H., Yokohama, Japan: Land, fresh-water, and marine shells from Japan, representing 40 species (33575); marine shells from Japan (33618).
- LORING, J. ALDEN, Department of Agriculture: Stone pestle obtained from a "Siwash" grave at Oroville, Wash. 32655.
- LOTSPEICH, A. C., Newport, Tenn.: Larva of *Citheronia regalis* Fabr. 32618.
- LOUNT, S. D., & SON, Phoenix, Ariz.: Specimen of Solpugid, *Dalames formidabilis* Simon. 32576.
- LOVELL, JOHN H., Waldoboro, Me., transmitted by Department of Agriculture: Sixty-nine species of hymenoptera. 33255.
- LOWE, HERBERT N., Long Beach, Cal.: Marine shells, representing 7 species. 33634.
- LOWE, V. H., Geneva, N. Y.: Three specimens of *Aphidius polygonaphis* Fitch. 32490.
- LOWERY, C. O., Smithland, Ky.: Crab spider, *Acrosoma rugosum* Hentz. 32422.
- LOZIER, Mrs. A., Washington, D. C.: Shuttle for a primitive heddle frame. 32041.
- LUCAS, F. A., U. S. National Museum: Birds from Pribilof Islands (32597); skins and skulls of mammals (32743).
- LUGGER, Prof. O., St. Anthony Park, Minn.: Ten specimens of *Apanteles* sp. from Germany. 33254.
- LUMHOLTS, Dr. (See under Dr. B. L. Robinson.)
- LUMSDEN, G. R., Greenville, Conn.: Forty-one specimens of insects. 32519.
- LYONNS, HERBERT F. W., Boston, Mass.: Fourteen proofs of wooden engravings executed by the donor. 32721.
- MCCABE, JOHN, Quarry, Iowa: Three small slabs with Kinderhook crinoids. 33348.
- MCCARDLE, JOHN, Leamington, Utah, received through the Bureau of Ethnology: Trilobite. 33627.
- MCDANIEL, W. L., Sulphur Springs, Tex.: Land shells, representing 3 species. 32818.
- MCDILL, J. T., Sparta, Ill., Specimens of Pleistocene coniferous fossil wood, McDILL, J. T.—Continued.
found on a coal bank about 80 feet below the surface. 32987.
- McFARLAND, Miss MARY, Washington, D. C.: Toy model of a stove, rice-pot, rice-stirrer, curry-pot, and water-ladle, from Siam. 33358.
- MCGREGOR, R. C., transmitted by Dr. D. S. Jordan, Stanford University, Cal.: Type specimens of *Apogon atricauda*, *Forcipiger flavissimus*, and *Brachyistius frenatus*, from Socorro and Guadalupe Islands (gift) (32819); 4 specimens of ground owls from California (gift) (33166); 22 birds' skins from California and the western section of the United States (exchange) (33180); skin of *Ammodramus halophilus* and 2 skins of *Ammodramus sanctorum* (gift) (33625).
- MCKINLEY, Hon. WILLIAM, President of the United States: Mounted head of a Texas steer. 33495.
- McLANAHAN, J. KING. (See under Pennsylvania Railroad Company.)
- McMILLAN, P. A., Banyan, Fla.: Skull of Black Skimmer, *Rynchops nigra*. 33546.
- McQUEEN, E. L., Dublin, Tex.: Larva of a small moth (*Lagoa pyxidifera* A. and S.). 32681.
- MACDONALD, Mrs. MARSHALL, Washington, D. C.: Oil portrait of Gen. George Washington. 33381.
- MACEY, C. F., Council, Idaho: Two specimens of *Cantharis cyanipennis* Say. 33616.
- MACKAY, GEORGE H., Boston, Mass.: Thirteen skins of birds of the United States and Cape of Good Hope. 33205.
- MAGER, Miss ERNESTINE, Walhalla, N. Dak.: Collection of plants. 33144.
- MAGRUDER, Mrs. E. A. H., Tennytown, D. C.: Collection of Roman antiquities, consisting principally of pottery and bronze objects. 33321.
- MANN, GUSTAVE, Munich, Germany: Ferns from the province of Assom. Purchase. 33419.
- MANN, Miss LIZZIE J., Upperville, Va.: Great Horned Owl, in the flesh. 32675.
- VON MARENZELLER, Dr., Vienna Museum, Vienna, Austria: Parasite (lent); parasites (exchange). 32344.
- MARINO, FRANK, Washington, D. C.: Snake from the District of Columbia. 33418.

- MARLATT, C. L. (See under William T. Davis.)
- MARSHALL, GEORGE, U. S. National Museum: Two young specimens of *Lepus sylvaticus*, from Laurel, Md. (33422); crayfish and sunfish from Laurel, Md. (33530); frog, *Rana sylvatica*, from Maryland (33623).
- MARSHALL, HENRY, U. S. National Museum: Pair of Florida Gallinules from Florida. 33423.
- MASON, Prof. O. T., U. S. National Museum: Seven photographs of Polynesian objects. 33740.
- MATHEWS, E. O., Mexico, Mexico. Forty-two archaeological objects from Mexico. Purchase. 33214.
- MATTHALL, L. C., Snoqualmie, Wash.: Spider, *Epeira trifolium* Hentz. 32612.
- MATTHEW, Dr. G. F. (See under New Brunswick, Canada: Natural History Society of New Brunswick.)
- MATTHEWS, ROBERT, Home City, Ohio: Specimen of *Canis familiaris*. 32525.
- MAURY, Miss CARLOTTA J., Cornell University, Ithaca, N. Y.: Specimens of *Anodonta edentula*, from Chautauqua Lake, New York. 33088.
- MAXON, W. R., Oneida, N. Y.: Specimen of *Dryopteris bootii*. 32515.
- MAYER, Dr. O. B., Newberry, S. C.: Two specimens of a scarabæid beetle, *Dynastes tityus* Linn.
- MAYNARD, GEORGE C., U. S. National Museum: Collection of telegraphic apparatus (33261); electric gas-lighting torch (33298). Deposit. (See also under Telegraphic Historical Society of North America.)
- MEAD, G. D., San Francisco, Cal.: Bird's nest. 33650.
- MEADE, Miss FLORENCE, West Salisbury, Vt.: Specimen of *Dicercia divaricata* Say. 32666.
- MEARNS, Dr. E. A., U. S. Army, Fort Myer, Va.: Mole, *Scalops aquaticus*, from Fort Myer, Virginia (32325); specimen of *Achillea millefolium* (32359); 6 birds' skins from Virginia (32385); 2 specimens of *Eptesicus fuscus* from Washington, D. C. (32469); land and fresh-water shells (33256), (33311), (33325), (33375); living unios from Texas, representing three species (33480); 3 birds' skins from the western part of the United States (33550);
- MEARNS, Dr. E. A.—Continued.
land and fresh-water shells and alcoholic specimens from Texas (33589); series of mammals, 51 birds' skins, crustaceans, insects, fossil shells and plants (33693).
- MEARNS, LOUIS DI Z., Fort Myer, Va.: Specimen of *Sitta canadensis*, from Virginia (gift) (32386); specimen of *Scalops aquaticus* (gift) (32501); 38 birds' skins (deposit) (32867); 2 caterpillars of *Citheronia regalis* Fabr. (gift) (32980); 2 alcoholic specimens of caterpillars of *Citheronia regalis* Fabr., bat, mole, and 3 snakes from Fort Myer, Va. (32980).
- MEER, F. B., estate of, received through W. J. Rhees, administrator: Marine shells from the coast of Florida, 5 starfishes, 3 echinoids, and a land tortoise. 33520.
- MEEKER, L. L., Darlington, Okla.: Received through Bureau of Ethnology. Indian game. 33596. (See under Smithsonian Institution, Bureau of Ethnology.)
- MEIJERE, Dr. J. C. H. DE, Amsterdam, Holland: Three hundred and seventy-three specimens of diptera. Exchange. 33424.
- MERRIAM, Dr. C. HART, Chief, Biological Survey, Department of Agriculture: Collection of mammals, consisting of about 5,000 skins and 6,000 skulls (private collection of Dr. Merriam (33212); marine shells from Bermuda (33633).
- MERRILL, Dr. G. P., U. S. National Museum: Fossils, minerals, and shells from Russia (32761); specimen of *Coccinella 7-punctata* from Budapest, Hungary (32923); salt and graphitic schist from Germany and andesite from Turkey (32940); berry basket made of birch bark from east European Russia (32947); 9 plants from Europe (32949); rocks and ores from a silver mine in Pribram, Bohemia, and coal from Karbitz, Bohemia; shells from Budapest, Hungary (32958); phosphate nodules, 115 specimens of fossils (32991); shells, fossils, and geological material from Russian Armenia and the Caucasus (33094); specimens of rock salt from Heilbrun, Prussia (33399); photograph of Ossetes, soldiers of the Caucasus mountains, Russia (33588).

- METCALF, O. (See under Agriculture, Department of.)
- METCALFE, J. K. (See under Agriculture, Department of.)
- MIDDLETON-WAKE, Rev. CHARLES H., Kent, England: Copy of "Catalogue of the engraved work of Albert Durer," by Mr. Middleton-Wake (32720); and of "The Invention of Printing" (33053).
- MILLER, GERRIT S., jr., U. S. National Museum: Lizard from Kensington, Md. (33597); snake and 2 plants from Kensington, Md. (33645); moths representing 17 species (gift) (33704).
- MILLER, H. M. A., San Francisco, Cal.: Twelve photographs of plants from Lower California, Mexico, 33231.
- MILLS, E. W., Webster Grove, Mo.: Rude notched axe from Missouri. 32308.
- MILLSPAUGH, C. F. (See under Field Columbian Museum.)
- MINNESOTA, UNIVERSITY OF, Minneapolis, Minn., transmitted by A. A. Heller: Violets from different localities. Exchange. 32888.
- MISSOURI BOTANICAL GARDENS, St. Louis, Mo.: Two specimens of *Cleome gigantea* and 15 specimens consisting principally of *Lemna* (gift) (32780); transmitted by J. B. S. Norton: specimen of *Lilaeopsis carolinensis* (exchange) (33069).
- MITCHELL, G. E., Washington, D. C.: Three eggs of woodcock from Virginia. 33347.
- MITCHELL, Hon. J. D., Victoria, Tex.: Crabs, shrimps, and insects from Texas (32447); specimen of *Glaudina* and eggs from Victoria (32470); 2 specimens of unios (32536); living Unionidæ from Victoria (32605); collection of insects (32668); living Unionidæ (32791); flatfish (*Parostoma brachiale*) and crustaceans from Matagorda Bay, Texas (32802); marine shells, representing 10 species (32809); land, fresh-water, and marine shells from Texas, representing 8 species (32934); 3 specimens of *Callinectes* from San Antonio Bay (33652); 2 plants (33725). (See under J. Forrester.)
- MITSUBURI, K., University of Tokyo, Tokyo, Japan: Alcoholic specimen of shark (*Chlamydoelachus*). 32839.
- MOCK, M. G., Muncie, Ind.: Three flint arrowheads and a photograph of stone, copper, and shell objects. 32583.
- MOFFATT, Dr. S., Wheaton, Ill.: Thirty plants. Exchange. 33508.
- MOFFATT, W. S., Chicago, Ill.: Medicinal plants. 33567.
- MOHR, Dr. CHARLES, Mobile, Ala.: Sixteen plants (32321); specimen of *Telanthera philoxeroides* Moq. (33198).
- MOISSAN, M. HENRI, Paris, France, transmitted by Mr. C. A. Doremus: Series of specimens of metals, carbides, and borides, illustrating the products of the electric furnace. 32448. Presented to the Smithsonian Institution and deposited in the National Museum.
- MONROE, Charles E., Milwaukee, Wis.: Twenty-four specimens of Hamilton group brachiopods. 33707.
- MONROE, W. A. (See under R. J. Redding.)
- MOONEY, JAMES. (See under Smithsonian Institution, Bureau of Ethnology.)
- MOORE, C. R., Birdnest, Va.: Mold for making pewter tablespoons, used by the early settlers of Virginia. 32509.
- MOORE, CLARENCE B., Philadelphia, Pa.: Three shell drinking cups and a large number of shell beads obtained from a mound in the northeastern end of Creighton Island, McIntosh County, Ga. (33038); fossil oysters from Grifins Landing, Ga. (33328); transmitted through Army Medical Museum: 3 skulls of Florida mound-builders (33669).
- MOORE, P. A., Rifle, Colo.: Flint chip-pings and broken arrow points from Garfield County, Colo. 32558.
- MORAN, C. A., Baltimore, Md.: Specimen of *Dynastes titus* L. 32547.
- MORGAN, Dr. E. L., Washington, D. C.: Specimen of chipmunk (*Tamias striatus*), from Fauquier County, Va. (32660); flying squirrel, *Sciuropterus volucella* (32926); specimen of *Sciuropterus*, two specimens of *Scalops aquaticus* (33659); gray squirrel, *Sciurus carolinensis* (33202).
- MORRIS, E. L., Washington, D. C.: Twenty-five plants. 32989.
- MORRIS, W. C., Marcus, Wash.: Specimen of *Mantispa brunnea* Say. 32610.
- MORSE, EDWARD LIND, Washington, D. C.: Pocket telegraph instrument, Professor Morse's note-book, passport; autograph letters. Deposit. 33377.

- MOSHER, R. F. (See under Harris, I. H., estate of.)
- MOSIER, C. A., Des Moines, Iowa: Fossil mollusk of ancient form taken from clay drift, and a small fragment of a drift boulder. 32467.
- MOSS, WILLIAM, Aston-under-Lyne, England: Two photographs of soft parts of English land snails (32617); specimens of *Unio pictorum* and *Anodonta cygnea* (32465); specimens of *Margaritana margaritifera* from Ireland (32863).
- MOSHER, B. F. (See under Harris, I. H., estate of.)
- MOTTER, Dr. M. G., Department of Agriculture: Specimens of *Vitrea minuscula*. 32368.
- MOURNING, NELSON, Washington, D. C.: Single-barreled, self-action, flat-hammer pistol, found on Columbia Heights, District of Columbia. 33470.
- MUNICH, GERMANY, Geologisch-Paläontologisches Institut: Two hundred and forty specimens of Tertiary corals, representing 94 species. Exchange. 33246.
- MURCH, CLARENCE, Cairo, Egypt: Fossil tooth of shark (*Caroharodon auriculatus*). 33097.
- MURPHY, J. K., Washington, D. C.: Vertebra of Dinosaur. 33153.
- MUSEO CIVICO DI STORIA NATURALE. (See under Genoa, Italy.)
- MUSEUM OF COMPARATIVE ZOOLOGY, Cambridge, Mass., transmitted by Dr. Walter Faxon: Fresh-water crabs, representing 5 species; exchange (32750); crabs (*Portunidae*), representing 12 species (gift) (33323).
- MUZEI IMPER. AKADEMII NAUK. (See under St. Petersburg, Russia.)
- NASHVILLE EXPOSITION EXHIBIT. (See under Interior Department, U. S. Geological Survey.)
- NATIONAL PEARL BUTTON COMPANY, Davenport, Iowa, transmitted by H. C. Pembeck, secretary: Valve of a unio, also powder ground from their shells. 32859.
- NATIONAL SOCIETY, D. A. R., received through Mrs. William Lindsay, Washington, D. C.: A "Mayflower chest" and a comb, both presented to the society by Mrs. Adrian V. S. Schenck. Deposit. 33297.
- NATURAL HISTORY SOCIETY OF NEW BRUNSWICK. (See under New Brunswick, Canada.)
- NAVARRO, Anibal Villa, Barranquilla, Colombia, South America: Specimen of "Euforbina," an antidote for snake bite. 33050.
- NAVY DEPARTMENT, transmitted by Hon. John D. Long, Secretary: Medal of honor bestowed by the Navy Department upon enlisted men of the Navy and Marine Corps for extraordinary services. 33363.
- NEAL, DANIEL R., jr., Washington, D. C.: "Pepper-box" revolver, 1837. 32994.
- NELSON, AVEN, Laramie, Wyo.: Twenty-two plants collected in Wyoming. Exchange. 33143. (See under Agriculture, Department of.)
- NELSON, E. W., Washington, D. C.: Two photographs of women: Valley of Mexico. 33294. (See under Agriculture, Department of, and Mrs. N. M. Brown.)
- NESMITH AND CONSTANTINE COMPANY, New York City: Large block of mahogany bored by *Teredo*. 33213.
- NESS, Prof. H. (See under Agriculture, Department of.)
- NEW BRUNSWICK, CANADA: Natural History Society of New Brunswick, St. John, transmitted by Dr. G. F. Mathew, curator: Thirty-three specimens, representing 20 species of fossil plants from St. John, New Brunswick. 33308.
- NEWELL, CHARLES F. (See under Brookdale Museum of Natural History.)
- NEW MEXICO AGRICULTURAL EXPERIMENT STATION, Mesilla Park, N. Mex., received through Prof. J. D. A. Cockrell: Miscellaneous collection of insects from New Mexico, including 128 specimens containing types and cotypes (32357); 2 specimens of hemiptera and 15 specimens of hymenoptera (32395); 23 specimens of hymenoptera (32774); 24 specimens of hymenoptera, 34 specimens of lepidoptera, including 4 types and 6 cotypes (33601); specimen of *Hesperapis elegantula* (33705).
- NEW YORK AQUARIUM, New York City: Specimen of *Mullus auratus*. 33003.
- NEW YORK COLONIZATION SOCIETY, New York City: Marine shells, representing 6 species, crustaceans, fishes, reptiles,

NEW YORK COLONIZATION SOCIETY—Continued.

- and mammals from Monrovia, Liberia, West Africa, collected by Mrs. J. D. Sharp, Mr. G. N. Collins, Rev. G. P. Goll, and Prof. O. F. Cook. 32600.
- NIEDERLEIN, GUSTAVO, Philadelphia, Pa.: Eighteen plants from Central America. 33536.
- NIX BROTHERS, Mount Pleasant, near Charleston, S. C.: Specimens of insects infesting asparagus. 32521.
- NORRIS, ISAAC T., Baltimore, Md.: Four photographs of seine-hauling at Havre de Grace. 32733.
- NORTON, J. B. S. (See under Missouri Botanical Garden.)
- NOZAWA, Prof. S. (See under Dr. L. Stejneger.)
- NYLANDER, O. O., Caribon, Me.: Five hundred specimens, representing 40 species of land and fresh-water shells, from northern Maine (exchange) (32606); specimens of *Margaritana margaritifera* (gift) (32661); land and fresh-water shells from Maine, representing 15 species (exchange) (32862).
- OEHME, Dr. F. G., Roseburg, Oreg.: Specimen of *Polycodon confertus* Lec., and its work. 32505.
- OSBURN, B., Phoenix, Ariz., transmitted through Bureau of Ethnology: Fragment of an ancient ceremonial cigarette found in a sacrificial cave near Tempe, Ariz. (33023); 2 specimens of a Darter (*Etheostoma sciotense*) from Big Walnut Creek, Scioto River, near Columbus, Ohio (33135).
- OGDEN, Capt. T. S., transmitted by C. H. Townsend, U. S. Fish Commission: Crab (*Calappa calappa* Linnaeus), from Guam Island, Ladrone Group. 32584.
- OGILBY, J. Douglas, Livingston road, Petersham, Sydney, New South Wales: Alcoholic specimens of Australian fishes. Exchange. 33031.
- OLDROYD, Mrs. IDA M., Los Angeles, Cal.: Marine shells, representing 3 species, from California (gift) (33117); corals from the coast of California (exchange) (32301); marine shells from San Pedro, California (32822).
- OLDS, H. W., Woodside, Md.: Specimen of *Polemonium reptans* (32360); plant (32574).
- OLIVE, J. E., Bastrop, Tex., transmitted by U. S. Geological Survey: Decomposed feldspar. 32453.
- OLNEY, Mrs. M. P., Spokane, Wash.: Two species of *Anodonta*. 32641.
- OMAHA EXPOSITION EXHIBIT. (See under Interior Department, U. S. Geological Survey.)
- ORR, LYCURGUS, Gallop, Mont.: Ironstone concretions. 32535.
- ORTMANN, RICHARD. (See under Smithsonian Institution.)
- OSBORN, H. L., Hamline University, St. Paul, Minn.: Fresh-water shells from Minnesota. 33557.
- OSGOOD, W. H., Biological Survey, Department of Agriculture: Twenty-five skins of birds of the United States. Exchange. 33182.
- OTIS, FRANK I., Mescalero, N. Mex.: Virginia rail in the flesh. 33150.
- OTTENBERG, Miss, Washington, D. C.: Mezuzah. 33524.
- PAINE, R. G., Washington, D. C.: Boa constrictor. 32354.
- PALMER, EDWARD: Earthworms and entomostraca, fresh-water shells, insects, geological material, archaeological objects, and reptiles from Mexico (purchase) (32559); specimen of *Capitulum annuum* (gift) (32933); 2 plants from Mexico (gift) (33111); 2 photographs of palm-wine tuba sellers, Colima, Mexico (gift) (33191); shells, crustaceans and earthworms, archaeological objects, ethnological objects from Mexico (gift) (33215). (See under Department of Agriculture.)
- PALMER, JOHN W., Delaware County Institute of Science, Media, Pa.: Microscopic slide containing *Homæocladia filiformis*. 32380.
- PALMER, J. W. (See under Royal Arch Masons, Grand Chapter, State of New York.)
- PALMER, WILLIAM, U. S. National Museum: Seventeen mammal skins and skull from Dismal Swamp, Virginia (32306); fox squirrel, *Sciurus cinereus*, from Hampstead, King George County, Va. (32329); specimen of *Lynx rufus* (gift) (32338); specimen of salamander from Virginia (32377); queen snake, *Tropidonotus leberis* (32449); specimen of *Neotoma floridana*, specimen of *Vesperugo*, and 3 specimens of *Atalapha*

PALMER, WILLIAM—Continued.

- borealis* (32475); shrike from Falls Church, Va. (gift) (33584); collection of natural-history specimens from Smith's Island, Virginia (32651); skunk *Mephitis mephitis* (32744); plant from Scott Run, Fairfax County, Va. (32782); specimen of Turnstone, *Arenaria morinella* (32787); 2 plants from Nashville, Tenn. (32923); 5 specimens of Trenton fossils from Nashville, Tenn. (32968); small collection of insects from Nashville, Tenn. (32983); marine shells and invertebrates from Smith's Island, Virginia (33631); 2 rabbits from Smith's and Fisherman's Islands, Virginia (33666); 2 specimens of *Rubus odorata* from Great Falls, Va. (33670). (See also under Dr. C. K. Clark.)
- PAMMEL, L. H., Ames, Iowa, received through Department of Agriculture: Two hundred and forty-eight plants collected in Iowa (33435); 122 plants (33629) exchange.
- PAPE, C. W., Manhattan, Kans.: Five skins and skulls of mammals, consisting of 3 spotted skunks, mole, and gopher. 32623.
- PARISH, S. B., San Bernardino, Cal.: One hundred plants from southern California. Purchase. 32969.
- PARKE, DAVIS & Co., Detroit, Mich.: Series of specimens illustrating biological products and curative sera. 33542.
- PARKER, CHARLES. (See under M. V. D. Badio.)
- PARKER, Dr. E. PENDLETON, Washington, D. C.: Specimens of oligochaetous worms from the Potomac River. 33092.
- PARKER, J. B., Danville, Ohio.: Unionidae from Ohio. 33724.
- PARKER, R. WAYNE, Newark, N. J.: Specimens of zinc ores from New Jersey mines. 32688.
- PARLIN, J. C., North Berwick, Me.: Seven specimens of *Antennaria parlinii*. 33509.
- PARTCH, Rev. V. F. (See under Chinanfu, China, Chinanfu Museum.)
- PATTERSON, A. J., U. S. consul, Demerara, British Guiana: Five birds' skins from British Guiana. 32920.
- PAUL, Miss FLORENCE, Washington, D. C.: Larva of *Lagoa crispata* Peck. 32526.
- PAYNE, ELIAS J., Olympia, Wash.: Specimens of building stones. 32523.
- PECKHAM, Prof. G. W., Haitland, Wis.: Three specimens of fossorial wasps (new to the collection). 32428.
- PEDRICK, W. E., Interior Department, U. S. Geological Survey, transmitted through C. W. Cross: Specimen of tetrahedrite from Good Hope Mine, Colo. 33723.
- PEMBECK, H. C. (See under National Pearl Button Company.)
- PENNOCK, F. M. (See under Quaker City Fruit Company.)
- PENNSYLVANIA RAILROAD COMPANY, (transmitted by T. N. Ely, chief of motive power, Philadelphia, Pa., and J. King McLanahan, Hollidaysburg, Pa.): Piece of strap rail used on the incline plane of the Portage Railroad (32811); received through R. P. Snowden, assistant engineer, Camden, N. J., 16 pieces of stone blocks and a box containing railroad spikes used in constructing railroad beds in 1831 (33467); received through J. T. Richards, engineer, maintenance of ways, Philadelphia, Pa., section of 100-pound rail with splice bar attached (33619).
- PERGANDE, THEO., Washington, D. C.: Collection of insects from Central America (33260); quartzite pebble resembling a hammer stone found on Corcoran Hill, Washington, D. C. (32759).
- PERIOLAT, C. F., Chicago, Ill.: Skin and skull of a Mount St. Elias bear, *Ursus emmonsii*. Purchase. 33159.
- PERRY, WALTER C., Bainbridge, Ga.: Specimen of *Anhinga*, in the flesh. 33290.
- PETERSON, O. A., Princeton, N. J.: Two hundred and thirty-nine rodents from Patagonia, consisting of *Cavia*, *Ctenomys*, *Notomys*, etc. Purchase. 33355.
- PHILLIPS, Mrs. EUGENIA. (See under Smithsonian Institution.)
- PHILLIPS, Dr. W. A., Evanston, Ill.: Photograph of an Indian woman engaged in spinning, and samples of fiber and cord used. 33022.
- PIETERS, A. J., Department of Agriculture: Plant. 32698.
- PILSBRY, H. A., Academy of Natural Sciences, Philadelphia, Pa.: Six specimens of unios from Lake Okeechobee, Flor-

PILSBRY, H. A.—Continued.

ida (gift) (32645), mounted jaw and radula of *Binneya notabilis* from Guadalupe Islands, California (exchange) (33489).

PINE, GEORGE, Aripeka, Fla.: Marine shells from Florida. 32370.

PIPER, C. V., Pullman, Wash.: Plants. 33196. (See under Agriculture, Department of.)

PIRSSON, L. V. (See under Interior Department, U. S. Geological Survey.)

PITTIER, H. (See under Costa Rica, Instituto Fisico-Geografico.)

PIWONKA, THOMAS, Cleveland, Ohio, (transmitted by G. H. Girty): Twenty-four invertebrate specimens from the Bedford shale, Cleveland, Ohio, and 3 invertebrates from the Cleveland shale, Bedford, Ohio; also a specimen of travertine containing leaf impressions. 32769.

PLEAS, C. E., Oolagah, Ind. T.: Unios, representing 6 species (gift) (32647); living unios (exchange) (32808).

PLITT, CHARLES E., Baltimore, Md.: Two plants. 33728.

POLLARD, C. L., U. S. National Museum: Plants (32413); specimen of *Viola sagittata* (32566); 300 plants obtained principally in Pennsylvania and New Jersey (32755); 6,800 plants (purchase) (32896); 2 plants (33173); specimen of *Antennaria neodioica*, obtained in Laurel, Md. (33537).

POLLOCK, W. M., Morgantown, W. Va.: One hundred and seventy-two specimens of dried plants collected in West Virginia. Exchange. 33207.

POPE, CHARLES A., Trenton, N. J., received through Bureau of Ethnology: Eight specimens of earthenware from Colombia. 33239.

POPE, RALPH W., New York City: Three snapper sounders. 32772. (See under American Institute of Electrical Engineers.)

POPENOE, Prof. E. A., Topeka, Kans.: One hundred and thirty-nine specimens of coleoptera from Kansas. 33259.

POTTER, A. F., Holbrook, Ariz. (transmitted by Dr. J. Walter Fewkes): Stone cup. 32789.

PRATT, F. C., Department of Agriculture: Eighty-one insects (32845); *Crambidia* sp., and specimen of *Crocata nigricans*

PRATT, F. C.—Continued.

(33005); 17 imagoes, 6 larvæ, and 3 pupæ of *Clydonopterum tecoma* (33565).

PRATT, Prof. HENRY S., Haverford, Pa.: Parasites. 32343.

PRENTISS, D. W., jr. U. S. National Museum: Reptiles, mammal skins and skulls, birds' skins, fishes, invertebrates (32542); curved knife, used for hollowing out canoes, obtained from the Yakutat Indians (gift) (33385).

PRICE, R. H., College Station, Tex., received through Department of Agriculture: Sixty-nine specimens of dried plants. Exchange. 33594.

PRIDE, H. A., Holland Patent, N. Y.: Specimen of woodcock, *Philohela minor* (mounted). 33379.

PRINGLE, C. G., Charlotte, Vt.: Five hundred Mexican plants (purchase) (32999); plant (gift) (33249).

PURPUS, C. A., Daunt, Cal.: Five hundred and forty plants. Purchase. 33635.

QUAKER CITY FRUIT COMPANY, Philadelphia, Pa. (transmitted by F. M. Pennock, Baltimore, Md.): Five specimens of Agave from Jamaica. 33578.

RADDEKS, V. C., Marion, N. Y.: Eight insects. 32586.

RALPH, Dr. W. L., Utica, N. Y.: Three birds' skins (gift) (32650); 37 birds' eggs from islands off the coast of Lower California (33055); (presented to the Smithsonian Institution and deposited in the National Museum); 2 birds' skins and two mounted birds (gift) (33242); 26 eggs and 4 nests, representing 5 species, from Texas (gift) (33333); 21 birds' eggs and 5 birds' nests from Florida (gift) (33390). (See also under A. W. Anthony.)

RAMBO, M. ELMER, Philadelphia, Pa.: Three birds' skins. 32373.

RANKIN, WALTER N., Princeton University, Princeton, N. J.: Two specimens of Fiddler crab, *Uca leptodactylus*, from the Bahamas. 33343.

RATHBUN, Miss M. J., U. S. National Museum: Insects, mollusks, and marine invertebrates from West Goldsboro, Me. 32589.

REBER, Judge THOMAS, Natchez, Miss.: Currency note for \$2.50, issued at Jackson, Miss., May 1, 1862. 32924.

REDDING, R. J., director Georgia Agricultural Experiment Station, Experi-

REDDING, R. J.—Continued.

ment, Ga.: Isopod crustaceans from a well at Metcalf, Ga.; collected by W. A. Monroe. 33052.

REID, Dr. S. L., Rountt, Ky.: Ten specimens of *Odontota dorsalis* Thunb. and specimen of *Dynastes tityus* Linn. 32497.

REYNOLDS, A. J., Connersville, Ind.: Archæological objects. 33087.

REYNOLDS, Dr. E. K., Washington, D. C.: Sixty-five plants. 33636.

RHEES, W. J. (See under Meek, F. B., estate of.)

RICE, Miss S. T., Worthington, Mass.: Three specimens of gentian. 32614.

RICHARDS, J. T. (See under Pennsylvania Railroad Company.)

RICHARDSON, James E., Ipswich, Mass.: Bead of citrine quartz. 33059.

RICHMOND, C. W., U. S. National Museum: Insects, marine invertebrates, birds' skins, plants, shells, mammal, bird skeleton. 32651.

RIDENOUR, WILLIAM B., Scranton, Pa.: Pupa of Sphinx-moth. 32337.

RIDGWAY, ROBERT, Myers, Fla.: Specimens of *Cariacus osceola*, and of *Sciurus* sp.; 82 birds' skins from southern Florida (33300); 83 birds' skins, reptiles and batrachians, fishes, marine invertebrates, from Florida (33359); marine shells, representing three species, from Florida (33436); specimens of Song Sparrow, in the flesh (33665); crocodile eggs from Florida (33709).

RIDGWAY, Dr. TH. EDWARD., Washington, D. C.: Natural formation (concretion) with two cavities, found near Shrewsbury, N. J. (32401); "claymore," from the battlefield of Bannockburn, used as a stage sword by J. Wilkes Booth (32405). Deposit.

RIES, HEINRICH, New York City: Clays and kaolins from Germany, Saxony, and other countries. 33289.

RILEY, J. H., Falls Church, Va.: Three specimens of *Buteo latissimus* and *Geothlypis formosa*, from Virginia (33104); 29 birds' eggs (8 sets) from Virginia (33346).

ROBESON, Mrs. M. I., Trenton, N. J.: Malay kris, and a short sword from Gilbert Island made of sharks' teeth secured to a cocoa-wood handle; robe

ROBESON, Mrs. M. I.—Continued.

made from the skin of a Polar bear. 33186.

ROBINSON, Dr. B. L., Botanic Gardens, Cambridge, Mass.: Four hundred and forty-six plants from northwestern Mexico, collected by Dr. Lumboltz in 1890 and 1892 (purchase) (32913); 1,700 specimens of plants belonging to the John Ball collection; miscellaneous collection of plants from the Gray Herbarium (gift) (32922); 1,711 specimens of the John Ball collection of insects (purchase) (32937).

ROCKHILL, Hon. W. W., U. S. minister, Athens, Greece: One hundred and nine stereoscopic slides illustrating his journey through Tibet (32439); crossbow for tiger killing, from Amoy, China (32669); photograph of a cart used in Sicily (32748).

ROE, FRANCIS A., Rear-Admiral, U. S. Navy: Sword from Congo River, Africa, obtained by Lieutenant Taunt. 32739.

ROPER, E. W., San Pedro, Cal.: Marine shells, representing 15 species, from California (33426, 33685).

ROSE, J. N., U. S. National Museum: Herbarium specimens collected in Mexico (32303); 40 specimens of insects from Mexico (33070); 45 plants (33197); marine shells, representing 4 species, from Guaymas, Mexico (33222); 6,000 plants collected in Mexico in 1897 (33695); 32 specimens of plants (33324); land shells from Mexico, representing 3 species (33642). (See also under Agriculture, Department of.)

ROSTAN, Dr. A., Piemont, Germany: One hundred and fifty-seven plants. Purchase. 32621.

ROTHROCK, Dr. THOMAS, Howard, Pa.: Stone implement, and teeth of a horse. 32599.

ROWLEE, Dr. W. W., Cornell University, Ithaca, N. Y., transmitted by Department of Agriculture: Fifty-three specimens of dried plants collected in Greenland. Exchange. 33233.

ROYAL ARCH MASONS, GRAND CHAPTER, STATE OF NEW YORK, transmitted by J. W. Palmer, Secretary: Bronze medal, commemorative of the centennial of the G. C. R. A. M. of the State of New York. 33234.

- RUDISILL, J. F., Arkadelphia, Ala.: Specimen of Albino worm-anake, *Celuta amana*, from Alabama. 33531.
- RUGGLES, BYRON P., Hartland, Vt.: *Phytonomus* sp. 32779.
- RUSCHERVEYH, G., Buenos Ayres, Argentina: Sixty-six specimens of lepidoptera. Exchange. 32886.
- RUSH, Dr. WILLIAM H., U. S. Navy., League Island Navy-Yard, Philadelphia, Pa.: Marine shells from Maldonado Bay, Uruguay, representing 6 species. Exchange. 32945.
- RUSSELL, I. C., U. S. Geological Survey: Fossil bones. 32436.
- RYAN, W. J., Garden, Okla.: Larva of *Argus labruscae* Linn. 32532.
- RYDBERG, P. A., Brooklyn, N. Y.: Thirty plants collected in Montana. 33116.
- SAFFORD, Prof. JAMES M., State Geologist, Vanderbilt University, Nashville, Tenn.: Phosphate rocks, ores, etc., from Tennessee. 32953.
- St. PETERSBURG, RUSSIA, Muzei Imper. Akademii Nauk: Land shells from Transcaspia and the Caucasus; marine shells from the Murman coast of Russia. Exchange. 33639.
- SALMON, Dr. D. E., chief, Bureau of Animal Industry, Department of Agriculture: Parasites. Deposit. 32345.
- SALONA, MANUEL, San Mateo, Fla.: Birds from Florida. Collected at the instance of Dr. William L. Ralph. 33654.
- SANFORD, E. L., Watertown, Conn.: Humming bird (*Trochilus colubris*), in the flesh. 32383.
- SANFORD, J. A., Stockton, Cal.: Six plants. 33700.
- SARGENT, Dr. C. S., Jamaica Plains, Mass. (transmitted by Department of Agriculture): Eight specimens of dried plants. Exchange. 33238.
- SARGENT, H. E. (See under Detroit Museum of Art.)
- SAUNDERS, Miss BELLE, Department of Agriculture: Herbarium specimen. 32699.
- SCHALLE, GUSTAVE, Sweet Springs, Mo.: Mastodon tooth and parts of two other fossil teeth. Returned. 32952.
- SCHIEB, Rev. HENRY. (See under Smithsonian Institution.)
- SCHMID, EDWARD S., Washington, D. C.: Black Swan (32906); 2 specimens of Black Swan, *Chenopsis atrata*, in the flesh (32969). Exchange.
- SCHÖNLAND, Dr. S. (See under Grahams-town, South Africa: Albany Museum.)
- SCHOOLCRAFT, Mrs. LUKK, Washington, D. C.: Glazed lithograph (framed) illustrating war scenes; Confederate money. 33261.
- SCHUCHERT, CHARLES, U. S. National Museum, and DAVID, WHITE, U. S. Geological Survey: Paleozoic invertebrates from the vicinity of Nashville, Tenn. (32419); shells and fossils from Greenland and Baffin Land (32658); 2 specimens of *Benthosema mülleri* and *Asternopterix gunnelliformis*, a very rare and interesting fish, from Omenak-Fiord, Greenland; Eskimo dog skull, porpoise skull, and skull of a Polar bear; Inuit skull and 5 fetal pinnepedia; collection of plants from New Campbelltown, Cape Breton, Baffin Land, and the following localities in Greenland: Omenak, Pagtorfik, Atane, Atanekerdruk, Sarfafiik, and Godhaven; 26 specimens of insects from Signuia, near Cape Haven, Baffin Land, bryozoa from Greenland (32686); piece of native iron from Karsak and 9 specimens of other minerals; 228 Inuit stone implements from Sarkak, Greenland; 3 Inuit stone implements from Greenland, and 20 Inuit stone chips from the same locality; 84 rock specimens from Greenland, Baffin Land, and Cape Breton; native fishhook from Godhaven, Greenland, and a nativesummer costume consisting of four pieces (32709); meteorite from Iowa (33732).
- SCHUMANN, Dr. K., Berlin, Germany: Three hundred and seventy-three specimens of Austro-African plants. 33441.
- SCHWARZ, E. A., Department of Agriculture: Collection of coleoptera of North America, representing about 12,000 species, and constituting the private collection of Messrs. Schwarz and Hubbard. 3311. (See under Henry G. Hubbard.)
- SCIDMORE, Miss E. R., Washington, D. C.: Collection of rubbings of reliefs on the chapel of the Wa Family (147 A. D.), of Shantung, China (gift) (33086); set of Japanese ceremonial knots, 17 plates, and 2 Japanese books (deposit) (33456);

SCIDMORE, Miss E. R.—Continued.

lac bracelets from Jeypore, India (gift) (33473); Chinese and Japanese pottery and bronzes (gift) (33558). (See under George Harries.)

SCIENCE COLLEGE, Imperial University. (See under Tokyo, Japan.)

SCOTT, Prof. W. H., Princeton University, Princeton, N. J.: Skeleton of condor eagle (32378); 43 birds' skins from Patagonia (32774). Purchase.

SCUDDER, Prof. S. H., Cambridge, Mass.: Twenty-one specimens of Acridiidae, representing 13 species (new to the Museum collection) (32534); 10 specimens of diptera, illustrating cotypes of Williston's (33006); 151 specimens of hymenopterous parasites including some types and cotypes of Dr. A. S. Packard and Dr. L. O. Howard (33071).

SEAL, WILLIAM P., Delair, N. J.: Two specimens of *Chologaster cornutus* and 2 specimens of *Elassoma zonata*. 33107.

SEATON-KARR, H. W., Wimbledon, England: Collection of rude chipped implements of flint and quartzite (Somaliland paleoliths). Purchase. 32485.

SEATTLE FISH COMPANY. (See under J. O. Cates.)

SHARP, Mrs. J. D. (See under New York Colonization Society.)

SHAW, ALFRED V., Newton Highlands, Mass.: Seven specimens of Baffin Land fossils from the Ordovician (Trenton) formation. 33002.

SHAW, Lieut. C. P., U. S. Navy, Alberene, Va.: Specimen of *Diadophis punctatus*. 32622.

SHAW, G. W., Corvallis, Oreg.: Specimen of tripolite. 33532.

SHELDON, Prof. C. S., Oswego, N. Y.: Three beetles (32578); 25 specimens of diptera (33517); (see under Agriculture, Department of).

SHEPARD, Dr. C. U., Charleston, S. C.: Indian money from South Carolina. 33109.

SHEPHERD, CLYDE, Oklahoma City, Okla.: Two living specimens of *Unio tuberculatus*. 32798.

SHERMAN, CHARLES F., Concepcion, Chile: Fourteen photographs of Pueblo Indian scenes. 33317.

SHIRLEY, HARRISON F., Enterprise, Idaho: Rear bone of gill of fish found in sedimentary sandstone. 33456.

SHOCK, W. H., commander, U. S. Navy, Washington, D. C.: Operculum and lingual ribbon of a specimen of *Fulgur carica*. 33241.

SHRIVER, HOWARD, Cumberland, Md.: Land shells, representing two species. 32715.

SHUFELDT, Dr. R. W., Takoma Park, D. C.: Eight specimens, representing a new species of *Holospira*, from Rio Grande Mountains, Brewster County, Tex. (32392); specimen of *Conorhinus rubrofasciatus* De Geer (32425); 2 photographs of a stone ornament or charm, found near Stonington, Conn. (32500); Cliff mouse, *Peromyscus truei*, from Fort Wingate, N. Mex. (32550); crustaceans, insects, and shells from Fort Wingate, N. Mex. (32625); specimen of *Lampropeltes rhombomaculatus* from the District of Columbia (32636); 4 photographs of birds and 3 photographs of mammals (32751). (See also under J. M. Hamilton.)

SHUFELDT, Dr. R. W., and PERCY SHUFELDT, Takoma Park, D. C.: Water snake (*Tropidonotus sipedon*). 32452.

SIMMER, HANS. (See under Carinthia, Austria: Die Freie Vereinigung Tiroler Botaniker, Dellach Oberdrauthale.)

SIMPSON, J. H., Manatee, Fla.: One hundred and thirty-five plants collected on the Keys of Florida (exchange) (33505); 61 plants from Florida (exchange) (33560); 99 plants (gift) (33735).

SIMPSON, R. L., Eufaula, Ind. T.: Specimen of *Corydalis cornutus* Linn. 32314.

SLOSSON, Mrs. ANNIE T., Franconia, N. H.: Ten specimens of diptera (32311); 16 specimens of diptera and 9 specimens of hymenoptera (32423); 9 specimens of hymenoptera (32848); moth, *Hypopta anna* Dyar (type specimen) (33599).

SMALL, J. K., Columbia University, New York: One thousand five hundred plants from the eastern section of the United States (exchange) (32556); specimen of *Cassia mississippiensis* (gift) (33045).

SMITH, CHARLES L., Wayne, Iowa: Five hundred and eighty-four specimens of dried plants from Mexico and Central America. Purchase. 32805.

SMITH, HARLAN I., American Museum of Natural History, New York City: Crustaceans from British Columbia. 33334.

SMITH, HERBERT H. (See under Carnegie Museum.)

SMITH, DR. H. M., U. S. Fish Commission: Small collection of dried plants collected at Lake Tahoe in 1896 (33037); snake from Monroe County, N. Y. (33178); 2 skull bones and a dermal plate of an Alligator Gar, *Lepidosteus tristachus* (33229). (See also under Fish Commission, U. S.)

SMITH, Prof. J. B., New Brunswick, N. J.: Type specimen of *Acronycta manitoba* Smith (32943); 7 specimens of *Lampronota occidentalis* (r. (33312); 14 Cuban and Mexican plants (32877).

SMITH, JARED G., Washington, D. C.: One-hundred and forty-two outline sketches of the achenia of *Sagittaria* (33129); 255 specimens of plants collected by G. Jermy in Mexico, Texas, and Hungary (33279); galena (sulphide of lead) (32484).

SMITH & WESSON, Springfield, Mass.: Thirty-eight caliber hammerless safety revolver and a solid frame hand-ejecting revolver. "O." 33409.

SMITH, WILLIAM R., superintendent, Botanic Garden, Washington, D. C.: Six specimens of *Yucca*. 32694.

SMITHE, J. CURTISS, Washington, D. C.: Tomahawk found on the grounds surrounding the monument erected in memory of Father Rale and the Norridgewock tribe, who were killed by the English in 1616. 33209.

SMYTH, C. H., jr., Clinton, N. Y.: Weathered and unweathered alnoite. 33501.

SMITHSONIAN INSTITUTION, Mr. S. P. Langley, Secretary:

Ten pieces of electrical apparatus. Deposit. 32407.

Engraving of Lewis H. Morgan. Gift. 32753.

Collection of photographs taken by the Hayden and other surveys, and a portfolio containing specimens of *Algæ*. Received through Miss Lucy H. Baird. 32842.

Collection of ethnological and archaeological objects from the District of Columbia. Received through Mrs. Engenia Phillips and Mr. Thomas Lee. 32872.

SMITHSONIAN INSTITUTION—Continued.

Collection of ethnological and archaeological objects from the South Sea Islands. Received through Mrs. Engenia Phillips and Mr. Thomas Lee. Lent. 32873.

Morse telegraph register. Presented to the Smithsonian Institution by Rev. Henry Scheib; transmitted by Mr. Richard Ortmann, and deposited in the National Museum. 32976.

Transmitted from the Bureau of Ethnology, Maj. J. W. Powell, Director.

Collection of ancient pottery and other ethnological objects from Arizona, made by Dr. J. Walter Fewkes (32434); mescal bread obtained from the Mescalera Apache Indians of New Mexico (32592); 3 shields and other paraphernalia belonging to a Kiowa Indian camp (32642); insects, marine invertebrates, birds' skins, plants, snake, mollusks, vertebrate bones, 2 specimens of *Phoca* from Greenland, and 5 pairs and pieces of caribou antlers, Eskimo skulls and other bones from Eskimo graves, Eskimo lamps, a pair of Eskimo woman's boots, and a model of an Eskimo igloo, from Greenland, collected by Robert Stein (32683); human skulls (32754); collection of ethnological objects from Patagonia and Terra del Fuego, made by J. B. Hatcher in 1896 and 1897 (32817); collection of stone implements, etc., from an old village site in Wichita, on North Fork of the Red River, Kiowa and Comanche Reservation, Okla. (32847) (collected by James Money); 22 boxes containing collections of Dr. J. Walter Fewkes in Arizona during the summer of 1897, comprising ancient pottery, etc. (32857); stone implements collected by William Huber, Hamilton, Ohio (32912); archaeological objects obtained from stone graves on the Ohio River near Maysville, Ky. (33411) (collected by Gerard Fowke); "medicine stone" or fetish of the "Dog Society" of the Indians, transmitted by L. L. Meeker, Darlington, Okla., and transferred to the National Museum (33449); pair of sandals obtained from the Pima Indians, from Salt

SMITHSONIAN INSTITUTION—Continued.

Transmitted from the Bureau of Ethnology—Continued.

River Valley, Arizona (33579). (See under A. L. Bolton, J. H. Bratley, James Crockett, Henry S. Gane, W. A. Kelker, John McCardell, B. Ogborn, C. A. Pope, A. F. Spiegelberg, V. W. Taylor, H. G. Webb.)

Transmitted from the National Zoological Park; Dr. Frank Baker, superintendent:

Marmoset, mink, seal, five young panthers, and a lynx (32330); snake (*Ophosaurus ventralis*), from New Smyrna, Fla. (32355); Blue Jay, *Cyanocitta stelleri anneoteris* (32446); 2 specimens of *Monachus tropicalis*, *Auchenia llama*, *Felis pardus*, *Putorius vison*, and *Zalophus californianus* (32473); specimens of *Cervus canadensis*, *Canis virginianus*, and *Putorius vison* (32590); *Putorius vison* from Virginia, and *Cynocephalus anubis* from New York (32609); Clarke's Nutcracker, in the flesh (32674); *Farancia abacura*, from Virginia (32714); osprey, in the flesh (32727); snake (*Rhinocylus lecontei*), from Texas (32824); lizard (*Basiliscus vittatus*), from Honduras (32825); Puma, *Felis concolor*, and California Sea Lion, *Zalophus californicus* (32846); specimen of *Crotalus confluentus*, from Kansas (32892); *Coluber obsoletus*, from Maryland (32893); *Ophiodon dolius*, from the District of Columbia (32894); kangaroo (*Macropus giganteus*), in the flesh (32946); jay (*Perisoreus*), in the flesh (32962); *Mitua tuberosa*, in the flesh (32965); *Crotalus confluentus* from Kansas (33072); Virginia deer, *Canis virginianus*, elk (*Cervus canadensis*) (33075); *Crotalus adamanteus*, from Florida (33073); anubis baboon, *Cynocephalus anubis*, hamadryas, *Cynocephalus hamadryas*, peccary, *Diocyles tajacu*, lynx, *Lynx rufus maculatus* (33106); Mule Deer, *Canis macrotis*, Spider Monkey (*Ateles*) (33177); brant, White Ibis, Canada goose, Toulouse goose, diamond rattlesnake (33206); crocodile (*Crocodilus americanus*), from Honduras (33225); hamadryas, *Cynocephalus hamadryas*, lynx, *Lynx rufus macu-*

SMITHSONIAN INSTITUTION—Continued.

Transmitted from the National Zoological Park—Continued.

latus, puma, *Felis concolor* (33258); *Antilocapra americana* and *Vulpes velox* (33427); *Alligator mississippiensis* (33471); lynx, *Lynx rufus*, peccary, *Diocyles tajacu*, Black Bear, *Ursus americanus* (33548); Pronghorn Antelope, *Antilocapra americana*, Kit Fox, *Vulpes velox* (33559); *Drymarchon corais couperi*, from Florida (33562); *Cebus hypoleucus* (33667); parrot (35702); skeletons of Golden Eagle, Wood Ibis, Red-tailed Hawk, and three magpies (33708).

SNOWDEN, R. P. (See under Pennsylvania Railroad Co.)

SNYDER, D. T., Washington, D. C.: Sheet of tickets issued by the Potomac and Shenandoah Navigation Lottery, No. 2, in 1812. 32856.

SNYDER, Dr. ELIZABETH, Philadelphia, Pa.: Four photographs of Moki and Yava Supai Indians. 33151.

SNYDER, Dr. F. D., Ashtabula, Ohio: Parts of two human skeletons; implement; notched sinker, 6 water-worn pebbles, plaster cast of polished stone hatchet; also map showing the location of the mound in which it was found. 33692.

SOCIEDAD GEOGRAFICA. (See under Lima, Peru.)

SØRENSEN, P. H., Jakobshavn, Greenland: Ethnological objects; birds, mammals, fishes, Holothurians; and crustaceans; from Jakobshavn, Greenland. Exchange. 33134.

SORIN, THOMAS R., Bisbee, Ariz.: Two specimens of polished stalagmites, from Copper Queen mine, Arizona. 32421.

SOUTHWICK, W. C., Raritan, N. J.: Specimen of Swainson's Thrush. 32347.

SPAINHOUR, Dr. J. M., Lenoir, N. C.: Specimen of *Monohammus confusor* Kirby. 32804.

SPENCE, R. S., Paris, Idaho, transmitted through U. S. Geological Survey: Three specimens of Triassic Ammonites (*Mecoceras*) from Idaho. 32365.

SPEELMAN, M. R., Washington, D. C.: Bat, in the flesh, from the District of Columbia. 33342.

SPERLING, ESTELLA, Washington, D. C.: Abnormal hen's egg. 33620.

- SPIEGELBERG, A. F., Santa Fe, N. Mex., transmitted by Bureau of Ethnology: Rude stone image (deposit) (32585); 2 stone images from an ancient pueblo in New Mexico (gift) (32766).
- SPINDLE, H. H., Shenandoah, Va.: Specimens of *Harrisia americana* Boissduval. 32725.
- SPRATT, M. B., New York City: Specimen of *Phobetron pithecium*, Abbott & Smith, 32551.
- SQUYER, HOMER, Wibaux, Mont.: Fresh-water shells, representing three species (33410); 23 specimens of Upper Cretaceous invertebrate fossils, representing 8 species, from Montana (33461); land and fresh-water shells from Montana (33497); living unios. Purchase. 32870.
- STANTON, T. W. (See under James M. Hamilton.)
- STANTON, Rev. W. A., St. John's College, Belize, British Honduras: Shells, corals, Echini, and other marine invertebrates from St. Georges Cay, near Belize (32631); 3 specimens of sea-urchin, coral, and marine shells (33060); corals and barnacles (33237); crustaceans from Belize and vicinity (33442); 17 corals and 2 sea-urchins from Spanish Cay, near Belize (33474).
- STEARNS, ELMER, Salt Lake City, Utah: Seeds of *Dasyliirion* sp. 32424.
- STEARNS, Dr. R. E. C., Los Angeles, Cal.: Specimen of *Tivela crassatelloides* from California. 32464.
- STEDMAN, Prof. J. M., transmitted through Dr. L. O. Howard, Columbia, Mo.: Type specimen of *Nothris malignemella* Murtfeldt. 33416.
- STEELE, E. S., Washington, D. C.: Specimen of *Onoclea struthiopteris* (32327); specimen of *Gyroslachys simplex*. (32513); 8 plants from in and near Washington, D. C. (32880).
- STEIN, ROBERT. (See under Smithsonian Institution, Bureau of Ethnology.)
- STEINER, Dr. ROLAND, Grovetown, Ga.: Collection of stone implements and archaeological objects from an aboriginal village site, Kiokoe Creek, Columbia County, Ga. (32334) (32670); archaeological objects from shell-heap on the Savannah River at the mouth of Kiokoe Creek (32800); 7 boxes containing archaeological objects from an aboriginal quarry and village site near Burts
- STEINER, Dr. ROLAND—Continued.
Mountain, Columbia County, Ga. (32871); stone relics from Columbia County, Ga. Deposit. (32930).
- STEITZ, ADAM, Baltimore, Md.: Fourteen plants collected in Maryland. 32361.
- STEJNEGER, Dr. L., U. S. National Museum: Natural history material from Japan and Kainchatka (33024); 2 bear skulls from Yezo Island, Japan, obtained by Prof. S. Nozawa, at Sapporo, Yezo (33114); natural history material from Commander Islands (33192); snapping turtle from Maryland (33512).
- STERKI, Dr. V., New Philadelphia, Ohio: Living unios, representing 4 species, from Marietta, Ohio. 32649.
- STEVENS, M. A., Newark, N. J.: Badge of the Woman's Relief Corps (auxiliary to the Grand Army of the Republic). 32929.
- STEVENS, S. GEORGE, Lincoln, N. Y.: Specimens of Pemphigids. 32575.
- STEVENSON, Mrs. CORNELIUS, Philadelphia, Pa.: Four photographs of ancient arbalists. 33287.
- STEWART, Mrs. JUNO, Washington, D. C.: Portraits on wood of President and Mrs. Madison, and a photograph of their home at Montpelier. 32487.
- STEWART, Dr. R. E., Goldendale, Wash.: Photograph of an arrowhead and bone holders. 32646.
- STEWART, Dr. T. B., Lockhaven, Pa.: Broken gunstock with the name "L. Wetzel" cut on one side, found in a creek at Waynesboro. 33591.
- STILES, CHARLES WARDELL, Department of Agriculture: Parasites (32339, 32340). Deposit.
- STILLWELL, L. W., Deadwood, S. Dak.: Two specimens of *Placenticerus* and one specimen of *Prionocyclus*. Purchase. "O." 33425.
- STONE, Gen. ROY, Department of Agriculture: Twenty geological specimens and 12 fossils from phosphate beds. 32740.
- STORMS, Prof. J. W., Ashland, Oreg.: Three specimens of fossiliferous sandstone from the Chico formation, south side of Bear Creek, Ashland, Oreg. 32366.
- STRAUB, Professor and Mrs. CARL, Port Orange, Fla.: One hundred and sixty-one specimens of cryptogamic plants

- STRAUB, Professor and Mrs. CARL.—Continued.
 belonging to the late Prof. F. C. Straub (32784); 3 boxes containing 1,403 plants collected by the late Prof. F. C. Straub (33446). (See under Prof. O. F. Cook.)
- STRICKER, J., Philadelphia, Pa.: Shuttle belonging to an ancient loom. 33475.
- STRODE, Dr. W. S., Lewiston Ill.: Seven specimens representing 2 species of unios from Georgia (32430); 2 living unios from Illinois (32462); living Unionidæ (32463); living Unionidæ representing 6 species from the Illinois River (32478); 3 unio shells containing animals (32951).
- SUBLETT, FRANK L., Staunton, Va.: Crab-spider, *Acrosoma gracile* Walck. 32390.
- SULZBERGER, DAVID, Philadelphia, Pa.: Jewish burial prayers (parchment manuscript on board). 33602.
- SUMWALT, C. H., New York City: Specimen of *Pelidnota sumptuosa* Vigors. 32530.
- SURBER, THADDEUS, White Sulphur Springs, W. Va.: Twelve mammals (gift) (32735); 2 skins of Fox Squirrel, *Sciurus ludovicianus vicinus* (exchange) (32844).
- SWINGLE, Prof. W. T. (See under Agriculture, Department of.)
- TABER, Miss MARY A., Mabel, Minn.: Leaf-cutting Bee, *Megachile frigida* Smith. 32455.
- TAFT, R. E., Leadville, Colo.: Upper portion of a femur of *Procamelus*. 33412.
- TAUNT, Lieutenant. (See under Rear-Admiral Francis A. Roe.)
- TAYLOR, V. W., West Winsted, Conn. (transmitted through Bureau of Ethnology): Stone implements from Farmington River valley. 32860.
- TAYLOR, WILLIAM TATE, Hannock, Mont.: Specimen of molybdenite from Madison County, Mont. 32375.
- TELEGRAPHIC HISTORICAL SOCIETY OF NORTH AMERICA (transmitted by Mr. George C. Maynard, Washington, D. C.): Morse telegraph register made in 1860, and used on the Elmira division of the Northern Central Railway from 1862 to 1868. Deposit. 33262.
- TELLER, Dr. E. (See under Agriculture, Department of.)
- THAYER, A. H., Dublin, N. H.: Specimen of Brewster's Warbler, *Helminthophila leucobronchialis* (32663); snake (*Storeria dekayi*) (32673).
- THOMPSON, J. F., Anacostia, D. C.: Hand grenade found on a battlefield near Bladensburg. 33179.
- THOMPSON, J. F., Anacostia, D. C.: Powderhorn, probably of Revolutionary era; sword found at Fort Greble, D. C., during the civil war, 1861-1865; bridle, bit, and lariat captured during the Mexican war by G. H. Miller, assistant architect of the Capitol. 33686.
- THOMSON ELECTRIC WELDING COMPANY, Lynn, Mass. (transmitted by Prof. Elihu Thomson): Nine specimens of electric-welded work, consisting of parts of bicycles. 33015.
- THOMSON, ELIHU. (See under Thomson Electric Welding Company.)
- THUROW, F. W., Harvester, Tex.: Twenty-nine plants from Texas. 32902.
- TICHENOR, G. H., Washington, D. C.: Nest and four eggs of English Sparrow. 32433.
- TODD, AURELIUS, Dunedin, Fla.: Specimen of *Agkistrodon piscivorus* from Florida (32850); *Elaps fulvius* from Florida (33273).
- TOKYO, JAPAN, Science College, Imperial University (received through Dr. I. Ijima): Reptiles and batrachians from the Island of Formosa. 33448.
- TOLLIN, OSCAR, Marco, Fla.: Shells from near Cape Romano, Florida (32632, 32680).
- TONER, Dr. J. M. (deceased): Badge of the Ninth International Medical Congress, 1887. 32813.
- TOPPING, D. LEROY, Washington, D. C.: Fifty-two plants. Exchange. 32577.
- TOUMEY, Prof. J. W., Tucson, Ariz.: Specimen of *Ligusticum scopulorum*. 32703. (See also under Agriculture, Department of.)
- TOWNSEND, CHARLES H., U. S. Fish Commission: Bones obtained from an ancient shell heap at Agattu Island. 32595. (See also under Ogden, Capt. T. S.)
- TRACY, S. M., Biloxi, Miss.: Fifteen plants from Mississippi. 33218.
- TRASK, Mrs. BLANCHE, Avalon, Santa Catalina Island, Cal.: One hundred plants from California. Purchase. 32954.

- TREASURY DEPARTMENT, U. S. Life-Saving Station**, transmitted by Capt. J. J. Dunton, keeper, Ocean City, Md.: Specimen of *Trichiurus lepturus*. 32554.
- TRELEASE, Prof. WILLIAM**, Missouri Botanical Gardens, St. Louis, Mo.: Five specimens of *Agaves* and 9 specimens of *Dasyllirion*. 32911. (See under Agriculture, Department of.)
- TRICE, V.**, Prague, Bohemia: Eight alcoholic preparations of cartilaginous fishes. Purchase. 33564.
- TRUE, F. W.**, U. S. National Museum: Mammal skins and skulls, reptiles, birds' skins, insects, marine invertebrates, fishes, from Maine. 32542.
- TURNER, H. W.** (See under J. A. Edman; Interior Department, U. S. Geological Survey, and G. W. Kimble).
- TURNER, L. M.**, Washington, D. C.: Danish lantern. Purchase. 33547.
- TURNER, Dr. PEYTON**. (See under Agriculture, Department of.)
- TYLER, A. A.**, Schenectady, N. Y.: Fifty-seven plants from Staten Island seaboard. Purchase. 32687.
- ULKE, HENRY**, Washington, D. C.: Specimen of *Bembidium rile* Leconte, from California (new to the collection). 32716.
- ULRICH, E. O.** (See under Interior Department, U. S. Geological Survey.)
- UNDERWOOD, C. F.**, National Museum, San José, Costa Rica: Twenty-one birds' eggs. Exchange. 33155.
- VAN DEUSEN, Mrs. ALYS B.**, Hartford, Conn.: Large platter and dinner plate (32710); small plate and cream pitcher (33500); 3 dinner plates and a tea plate (32504). Deposit.
- VAN HORNE, C. P.**, Glen, N. Y.: Rude chipped implement (gift) (33076); fragments of pottery from prehistoric Mohawk camp sites, also 1 flint implement (exchange) (33266).
- VAN HYNING, T.**, Des Moines, Iowa: Fifty-five shells from various localities. 32492.
- VAN NESS, jr., JOHN**, De Soto, Miss.: Thirteen specimens of Tertiary invertebrate fossils, rib of fossil cetacean, and tooth of fossil shark. 33121.
- VANDEVENTER, G. B.**, Huntsville, Ala.: Pentremite from Madison County, Ala. 33485.
- VASEY, Miss FLORA N.**, U. S. National Museum: Eighty plants from Nantucket, Mass.; (32552); 6 plants (32616); 2 plants (32692); 2 specimens of *Acer rubrum* (32781).
- VASEY, G. R.** (See under Agriculture, Department of.)
- VAUGHAN, T. WAYLAND**, U. S. Geological Survey: Eocene fossils from Louisiana (gift) (32374); 17 Tertiary corals from Europe and Cretaceous Rutistidae (gift) (33288); 7 Tertiary corals from Europe (purchase) (33367); land and freshwater shells from Alabama (gift) (33734).
- VIENNA, AUSTRIA: K. K. Naturhistorisches Hofmuseum, Botanische Abtheilung**, transmitted by Dr. G. von Beck: One hundred plants (33272); transmitted by Dr. Theo. Fuchs; 65 specimens of Tertiary plants representing 9 species (32698). Exchange.
- VOLLAND, Mrs. LARISSA**, Gettysburg, Pa.: Shell-cap from the Gettysburg battlefield. Purchase. 33675.
- WACKSMUTH, Mrs. CHARLES**; Burlington, Iowa: Eight crinoids and 2 blastoids from the St. Louis formation of Alabama. 33352.
- WAGHORNE, Rev. A. C.**, Bay of Islands, Newfoundland: Thirty-nine specimens of dried lichens (gift) (33016); 85 Labrador lichens and a specimen of *Sphagnum* (purchase) (33193).
- WAGNER FREE INSTITUTE OF SCIENCE**, Philadelphia, Pa.: Type specimen of *Pectunculus virginia* Wagner. 33478.
- WAKEHAM, Dr. WILLIAM**, Department of Marine and Fisheries, Ottawa, Canada: Diatoms, marine invertebrates, fishes, and mollusks. 33479.
- WALCOTT, Hon. CHARLES D.**, Acting Assistant Secretary U. S. National Museum: Three pairs of antlers of *Cervus carolinensis*, from Yellowstone National Park. 33544.
- WALKER, BRYANT**, Detroit, Mich.: Three unios from Alabama (32764).
- WALKER, Mrs. S. B.**, Castle Rock, Colo.: Teeth of fossil shark. 33302.
- WALLINGSFORD, W. W.**, U. S. National Museum: Gold button of the Union Veteran Corps (32938); pearl from a specimen of *Venus mercenaria*; Chesapeake Bay, Maryland (33236).

- WALPOLE, F. A., Department of Agriculture: Plant. 32569.
- WAMSLEY, F. W., Bridgeton, N. J.: Two jellyfishes and a specimen of coral. 33263.
- WAR DEPARTMENT, transmitted by Gen. R. A. Alger, Secretary of War: Medal of honor, and bow-knot issued to officers and soldiers for gallantry in military service (33431); *Army Medical Museum*, a collection of 2,205 specimens of Indian crania (33553). (See under Clarence B. Moore.)
- WARD, Prof. LESTER F., U. S. Geological Survey: Ninety-two plants from Chicago, Ill. (32561); 100 plants collected in Kansas (32697).
- WARDER, BUSHNELL & GLESSNER COMPANY, Chicago, Ill.: Four photographs of "Champion" binders. 33576.
- WARD'S NATURAL SCIENCE ESTABLISHMENT, Rochester, N. Y.: Thirteen lemurs (purchase) (32381); 5 mammal skins and skulls (purchase) (32382); 32 birds' skins (purchase) (32594); collection of sponges, corals, echini, (purchase) "N" (33235); 74 Upper Carboniferous fossils from Graham, Tex.; 12 crinoids from the Niagara of Perryville, Tennessee (exchange) (33362); ores from various localities (purchase) "O" (33370); skin of Wandering Albatross (purchase) "O" (33368); series of Beecher Brachiopod models, consisting of 20 specimens (purchase) "O" (33406); septarian nodules (purchase) (33462); photographs and negatives of a Finback Whale skull (purchase) (33690); nickel and cobalt specimens (purchase) "O" (33663); skull of porpoise (purchase) (33684); skeleton of fresh-water dolphin (gift) (33684).
- WASHINGTON, HENRY S., Locust, N. J.: Typical Italian and other volcanic rocks. 32734.
- WATANABE, KANO, Hongoku, Tokio, Japan: Two hundred and thirty-four specimens of Japanese plants. Purchase. 33657.
- WATKINS, J. E., U. S. National Museum: An etched half-tone picture of the *Monitor* and *Merrimac*, from a wash drawing by Sheppard. 32758.
- WATSON, T. L., Chatham, Va.: Fresh and decomposed diabase. 33486.
- WAYMAN, G. TURNER, Trinidad, West Indies: Cicada pupa, affected with *Entomophora*. 32318.
- WAYNE, ARTHUR T., Mount Pleasant, S. C.: Three birds' skins (exchange) (32387); 2 birds' skins (gift) (32388).
- WEBB, H. G., Castle Gate, Utah (transmitted by Bureau of Ethnology): Small piece of cordage from a cave dwelling on Minnie Maud Creek, Utah. 32967.
- WEBB, JOHN S., Disputanta, Va.: Barred owl. 33301.
- WEBBER, H. J. (See under Agriculture, Department of.)
- WEBSTER, Prof. F. M., Wooster, Ohio: Nineteen specimens of *Blissus leucopterus* Say. 32451.
- WEED, W. H. (See under Interior Department, U. S. Geological Survey.)
- WREDEN, W. C., U. S. National Museum: Five rats. 33718.
- WENTZ, J. F., Ellsworth, Wis.: Specimen of *Sorex personatus*. 32502.
- WENZEL, F. W., Philadelphia, Pa.: Insects representing species new to the Museum collection. 32820.
- WESTERN PENNSYLVANIA HISTORICAL SOCIETY, Bellevue, Pa. (transmitted by Thomas Harper, curator): Carboniferous plants found on Peters Creek, Washington County. Exchange. 33085.
- WESTGATE, W. W., Houston, Tex.: Specimens of living Unionida. 32593.
- WETMORE, GEORGE H., Hilo, Hawaii: Plant. 33420.
- WETZLER, JULIUS, Holbrook, Ariz.: Toy ladle, obtained from a ruin near Holbrook. 32476.
- WHEELER, C. F., Michigan Agricultural College, Agricultural College, Michigan: Five specimens of *Tradescantia* from the grounds of the Michigan Agricultural College. Exchange. 33322.
- WHITE, A. HOLLIS, Braintree, Mass.: One hundred and sixty-two specimens of Baffin Land fossils, representing 39 species. Purchase. 33146.
- WHITE, DAVID, U. S. Geological Survey: specimen of Turnstone (*Arenaria interpres*) from Greenland (32712); woman's costume and snow knife, obtained from the Eskimos of Greenland (33587). (See also under E. G. Dyer and Charles Schuchert.)

- WHITED, KIRK, Ellensburg, Wash.: Twenty-nine plants from Washington. 32812.
- WHITING, Dr. C. A., University of Utah, Salt Lake, Utah: Toad (*Bufo columbianus*) (32477); fresh-water crustaceans (33102); specimens of algæ, insects, and marine invertebrates from Salt Lake City (33484).
- WICKHAM, Prof. H. F., Iowa City, Iowa: Pompiliid, *Agonia architecta* Say, and a specimen of *Trachela tranquilla* Hentz. 32441.
- WILDER, G. D., Pekin, China: Twenty-three skins of Chinese birds, received in exchange. (33017, 33230, 33741.)
- WILLIAMS, F. H., Greene, N. Y.: Two hundred and ninety paleozoic fossils, representing 101 species. 33103.
- WILLIAMS, Dr. F. H., Bristol, Conn.: Four photographs of rock boulders with curious markings. 33138.
- WILLIAMS, ISAAC, Meadville, Pa.: Geometrid moth, *Hamatopsis grataria* Fabr. 32544.
- WILLIAMS, R. S., Columbia Falls, Mont. (received through Department of Agriculture): Twelve plants collected in Montana in 1897. 32901.
- WILLIAMSON, E. B., and OGBURN, R. C., Columbus, Ohio: Two specimens of a supposed new Darter, *Etheostoma sciotoense*, from Big Walnut Creek, Scioto River, near Columbus, Ohio. 33135.
- WILLIAMSON, Mrs. M. BURTON, Los Angeles, Cal.: Specimens of *Modiola capax* Conr., from San Pedro and Redondo, Cal. 32793.
- WILLISTON, Prof. I. W. (See under Kansas, State University of.)
- WILSON, G. W. (See under Florida Times-Union and Citizen.)
- WINCHESTER REPEATING ARMS COMPANY, New Haven, Conn.: Three modern rifles. 33491.
- WINSLOW, Lieut. HERBERT, U. S. Navy, Boston, Mass.: United States flag used on board the U. S. S. *Kearsarge* at the time of the surrender of the Confederate steamer *Alabama* 33686.
- WINTON, Rev. GEORGE B., San Luis Potosi, Mexico: Twelve photographs of scenery near Lake Patzcuaro, Mexico. 33519.
- WOLTZ, GEORGE W., U. S. National Museum: Sharp's carbine, issued by the United States Government to Baker's Cavalry and used throughout the war of the rebellion (deposit) (32832); specimens of *Mus decumanus* from Washington, D. C. (33586, 33622); 3 specimens of *Mus decumanus* (33664).
- WOLVERTON, N. (See also under Agriculture, Department of.)
- WOOD, C. F., Marion, N. Y.: Parasites (*Pelecinus polyturator* Drury, and *Thalassa lunator* Linn.). 32514.
- WOOD, J. MEDLEY, Natal Botanic Gardens, Sereia, Durban, Natal, Africa (received through Department of Agriculture): One hundred and seventy-five plants. Exchange. 33648.
- WOODDELL, G. P., Seven Oaks, Fla.: Sea-urchin, fragment of *Pterogorgia acerosa* Ehrenbers, and 2 marine shells. 32474.
- WOOLMAN, LOUIS, Philadelphia, Pa.: Tertiary fossils from the Dismal Swamp. 33080.
- WOOSTER, A. F., Norfolk, Conn.: English half-penny: George III. 33720.
- WORCESTER, Prof. D. C., Ann Arbor, Mich.: A large collection of birds' skins and birds' eggs and nests from the Philippine Islands. 32543.
- WORTHEN, C. K., Warsaw, Ill.: Skin and skull of mink. 33608.
- WRIGHT, B. H., Penn Yan, N. Y.: Unios from Eastern and Southern parts of the United States (32367, 33397, 32450, 32504, 32619, 32914, 32935, 32998, 33026, 33133, 33175).
- WRIGHT, W. G., San Bernardino, Cal.: Lizard, *Sceloporus magister*. 32835.
- WRIGHTSEN, Miss ANNIE, Albany, N. Y.: Fifteen pieces of electrical apparatus. Purchase. 33204.
- WYNKOOP, A. G., Charlestown, W. Va.: Caterpillar of Sphinx moth, *Thyreus abbotii* Swains. 32442.
- YAN FOO LEE, New York City (transmitted by Mr. W. V. Cox): Three agricultural implements. 33033.
- YOUNG, Dr. G. B., U. S. Marine-Hospital Service, Delaware Breakwater Quarantine Station: Snake.

ZABRISKIE, Rev. J. L., Flatbush, Long Island (transmitted through Department of Agriculture): Forty-five specimens of coleoptera, hemiptera, and hymenoptera (33211); 24 specimens of hymenoptera (33331).

ZEILLER, RENE, Paris, France: Two specimens of *Neuropteris scheuchzeri* Hoffm.

ZEILLER, RENE—Continued.

from Serkis-Bey, near Amasra, Asia Minor, and 3 specimens of *Neuropteris scheebani* Stur. from northern France. 32840.

ZUCK, F. A., Holbrook, Ariz.: Silicified wood from Arizona and Montana. Purchase. "O." 33662.

APPENDIX III.

STATEMENT OF THE DISTRIBUTION OF SPECIMENS DURING THE YEAR ENDING JUNE 30, 1898.

AFRICA.

Albany Museum, Grahamstown, South
Africa: Bird skins (84 specimens).
Exchange. (D. 11237.)

AMERICA.

NORTH AMERICA.

CANADA.

New Brunswick.

Natural History Society of New Brun-
swick, St. John: Fossil plants (90
specimens). Exchange. (D. 11717.)

Ontario.

Geological Survey of Canada, Ottawa:
Fossils from Thedford, Ontario (276
specimens, 43 species). Lent for
study. Sponge (*Grantia monstruosa*).
Gift. (D. 11105, 11763.)

UNITED STATES.

Alabama.

Ninth District Agricultural School,
Blountsville: Rocks and ores (104
specimens, set 37). Gift. (D. 11566.)
University of Alabama, Tuscaloosa:
Cambrian Medusæ (4 specimens).
Gift. (D. 11609.)

Arkansas.

Arkadelphia Methodist College, Arka-
delphia: Marine invertebrates (312
specimens, Series VI, set 18). Gift.
(D. 11446.)

California.

Brandegge, Katherine, San Diego:
Plants (2 specimens). Exchange.
(D. 11553.)

Brandegge, T. S., San Diego: Plant (1
specimen). Lent for study. Plants
(3 specimens). Exchange. (D. 11368,
11773.)

California Academy of Sciences, San
Francisco: Isopods (15 specimens).
Gift. (D. 11806.)

California—Continued.

California College, Oakland: Rocks
and ores (103 specimens, set 51). Gift.
Marine invertebrates (312 specimens,
Series VI, set 31). Gift. (D. 11091,
11485.)

Cooke, Miss J. M., San Diego: Shells (103
specimens). Exchange. (D. 11839.)

Fall, H. C., Pasadena: Beetles (136
specimens). Lent for study. (D. 11361.)

Golden Gate Museum, San Francisco:
Original stone implements (210 speci-
mens, set 16); casts of arrowheads
and spearheads. Exchange. (D.
11296.)

Grinnell, Joseph, Pasadena: Bird
skins (57 specimens). Lent for study.
(D. 11177, 11233.)

Jordan, David S., Leland Stanford
Junior University: Alcoholic fishes
(3 specimens); Lamprey eel from
Kamchatka (1 specimen). Lent for
study. Commander Island fishes (15
specimens). Exchange. (D. 11405,
11750, 11692.)

McGregor, R. C., Palo Alto: Bird skins
(44 specimens). Exchange. (D. 11601.)

Colorado.

Lee, Harry A., Denver: Geological ma-
terial (48 specimens); volcanic rocks
(7 specimens). Exchange. (D. 11613,
11841.)

Richardson, D. A., Denver: *Leptosy-
napta girardii* (1 specimen). Lent for
study. (D. 11391.)

University of Denver, University Park:
Rocks and ores (set 45). Gift. (D.
11262.)

Connecticut.

Cornell, Mrs. Thomas L., Derby: Pot-
tery (15 specimens). Exchange. (D.
11856.)

Wesleyan University, Middletown:
Fossils (32 specimens). Gift. (D.
11622.)

Connecticut—Continued.

Yale University Museum, New Haven: *Palæmonetes antrorum* (6 specimens) and *Cirolanides texensis* (3 specimens). Exchange. (D. 11729.)

Delaware.

Canby, W. M., Wilmington: Ferns (22 specimens); Mexican plants (838 specimens); plants (265 specimens). Exchange. (D. 11511, 11923, 11950.)

District of Columbia.

Bartsch, Paul, Washington: Plants (12 specimens). Exchange. (D. 11558.)

Central High School, Washington: Marine invertebrates (315 specimens, Series VI, set 5). Gift. (D. 11384.)

Eastern High School, Washington: Marine invertebrates (315 specimens, Series VI, set 5). Gift. (D. 11384.)

Gill, Theodore, Washington: Starfishes (6 specimens). For study. (D. 11549.)

Girty, George H., U. S. Geological Survey, Washington: English carboniferous fossils (211 specimens). Lent for study. (D. 11392.)

Howell, E. E., Washington: Fossils (47 specimens). Exchange. (D. 11742.)

Powell, J. W., Bureau of Ethnology, Washington: Pipes (25 specimens). Lent for study. (D. 11850.)

Schmid, Edward S., Washington: Three bird skins; mounted peacock; skeleton of monkey. Exchange. (D. 11396, 11497, 11858.)

Walcott, C. D., U. S. Geological Survey: One piece of Pueblo pottery. Exchange. (D. 11846.)

Western High School, Washington: Marine invertebrates (Series VI, set 6). Gift. Plants (46 specimens). Exchange. (D. 11385, 11536.)

Florida.

Simpson, J. H., Manatee: Rocks and minerals (70 specimens). Exchange. (D. 11861.)

Georgia.

Georgia Female Seminary, Gainesville: Marine invertebrates (312 specimens, Series VI, set 10). Gift. (D. 11426.)

Lucy Cobb Institute, Athens: Marine invertebrates (312 specimens, Series VI, set 24). Gift. (D. 11452.)

North Georgia Agricultural College, Dahlonega: Marine invertebrates (312 specimens, Series VI, set 36). Gift. (D. 11528.)

Illinois.

Coulter, J. M., University of Chicago, Chicago: Miscellaneous plants (10 specimens). Exchange. (D. 11423.)

Field Columbian Museum, Chicago: Cyprinoid fishes (3 specimens). Exchange. (D. 11678.)

High School, Farmington: Marine invertebrates (312 specimens, Series VI, set 11). Gift. (D. 11427.)

High School, Pittsfield: Marine invertebrates (312 specimens, Series VI, set 22). Gift. (D. 11450.)

High School, Princeton: Marine invertebrates (315 specimens, Series VI, set 41). Gift. (D. 11565.)

High School, Springfield: Rocks and ores (104 specimens, set 40). Gift. (D. 11362.)

High School, Streator: Marine invertebrates (312 specimens, Series VI, set 25). Gift. (D. 11470.)

High School, Table Grove: Marine invertebrates (315 specimens, Series VI, set 43). Gift. (D. 11628.)

Holmes, Samuel J., Chicago: *Lophoranthus* (3 specimens). Lent for study. (D. 11587.)

Irving Park School, Chicago: Rocks and ores (104 specimens, set 32). Gift. (D. 11708.)

Millsbaugh, C. F., Chicago: Plants (8 specimens). Lent for study. (D. 11465.)

Moffatt, W. S., Wheaton: Plants (24 specimens). Exchange. (D. 11954.)

Ottawa Township High School, Ottawa: Marine invertebrates (312 specimens, Series VI, set 15). Gift. (D. 11434.)

University of Chicago, Chicago: Volcanic rocks (50 specimens). Exchange. (D. 11527.)

Watase, S., Chicago: Three species of phosphorescent fishes. Lent for study. (D. 11658.)

Indiana.

City public schools, Washington: Marine invertebrates (315 specimens, Series VI, set 1). Gift. (D. 11364.)

Daniels, L. E., Laporte: Shells (208 specimens). Exchange. (D. 11278.)

High School, Evansville: Marine invertebrates (312 specimens, Series VI, set 28). Gift. (D. 11471.)

Indiana—Continued.

Lilly, Eli, & Co., Indianapolis: Plants (11 specimens). Lent for study. (D. 11965.)

Iowa.

Agricultural College, Ames: Plants (38 specimens). Exchange. (D. 11955.)

City schools, Osage: Rocks and ores (104 specimens, set 47); marine invertebrates (315 specimens, Series VI, set 4). Gift. (D. 11263, 11383.)

Cox, L. A., Keokuk: Specimen of Crinoid (*Pentacrinus decorus*). For study. (D. 11770.)

Denison Normal School and Business College, Denison: Rocks and ores (104 specimens, set 44); marine invertebrates (315 specimens, Series VI, set 3). Gift. (D. 11268, 11382.)

Des Moines College, Des Moines: Marine invertebrates (312 specimens, Series VI, set 16). Gift. (D. 11444.)

High School, Algona: Minerals (57 specimens, set 191). Gift. (D. 11784.)

High School, Clarinda: Rocks and ores (104 specimens, set 36). Gift. (D. 11617.)

High School, Cresco: Rocks and ores (104 specimens, set 42). Gift. (D. 11349.)

High School, Innwood: Marine invertebrates (312 specimens, Series VI, set 7). Gift. (D. 11386.)

High School, Lake Mills: Marine invertebrates (318 specimens, Series VI, set 45). Gift. (D. 11701.)

High School, Marion: Marine invertebrates (318 specimens, Series VI, set 46). Gift. (D. 11732.)

High School, Marshalltown: Marine invertebrates (312 specimens, Series VI, set 32). Gift. (D. 11486.)

High School, New Hampton: Rocks and ores (104 specimens, set 34). Gift. (D. 11629.)

Oceola County public schools, Sibley: Rocks and ores (104 specimens, set 35). Gift. (D. 11616.)

Public schools, Forest City: Marine invertebrates (312 specimens, Series VI, set 51); rocks and ores (104 specimens, set 30). Gift. (D. 11788.)

Public schools, Logan: Marine invertebrates (312 specimens, Series VI, set 21). Gift. (D. 11449.)

Iowa—Continued.

Public schools, Paullina: Marine invertebrates (318 specimens, Series VI, set 40). Gift. (D. 11556.)

Public schools, Spencer: Marine invertebrates (315 specimens, Series VI, set 34). Gift. (D. 11508.)

Public schools, West Bend: Marine invertebrates (312 specimens, Series VI, set 9). Gift. (D. 11425.)

Sac City Institute, Sac City: Marine invertebrates (318 specimens, Series VI, set 48). Gift. (D. 11711.)

Western Normal College, Shenandoah: Marine invertebrates (312 specimens, Series VI, set 27). Gift. (D. 11467.)

Kansas.

Agricultural College, Manhattan: Plants (18 specimens). Exchange. (D. 11953.)

Campbell University, Holton: Rocks and ores (104 specimens, set 43). Gift. (D. 11332.)

Chapman, George W., Cawker City: Corals (34 specimens); shells (133 specimens). Exchange. (D. 11907.)

Cooper Memorial College, Sterling: Marine invertebrates (312 specimens, Series VI, set 33). Gift. (D. 11498.)

High School, Laeygne: Dried marine invertebrates (126 specimens). Gift. (D. 11435.)

Kentucky.

High School, Hopkinsville: Marine invertebrates (318 specimens, Series VI, set 39). Gift. (D. 11561.)

Louisiana.

Frierson, Lorraine S., Frierson: Unionidae (77 specimens). Exchange. (D. 11775.)

Maine.

Bayley, W. S., Waterville: Geological material (5 specimens). Exchange. (D. 11792.)

Farmer, Miss Sarah J., Elliott: Photographs of Professor Henry and of experimental apparatus used by him. Lent for exhibition. (D. 11133.)

High School, Presque Isle: Marine invertebrates (312 specimens, Series VI, set 57); rocks and ores (104 specimens, set 29). Gift. (D. 11905.)

Knight, O. W., Bangor: *Cistothorus stellaris* (8 specimens). Lent for study. (D. 11933.)

Maine—Continued.

Lee, L. A., Brunswick: Twenty specimens each of *Serolis* and *Apus*. Exchange. (D. 11321.)

Normal School, Gorham: Minerals (57 specimens, set 193). Gift. (D. 11835.)

Williams, Mrs. Mary Wood, Mount Desert: Casts of Assyrian seals. Exchange. (D. 11175.)

Maryland.

Maryland School for the Blind, Baltimore: Marine invertebrates (102 specimens). Gift. (D. 11421.)

Ortmann, Richard, Baltimore: Three photographs of the Morse telegraph register. (D. 11641.)

Smith, J. Donnell, Baltimore: Plants 8 (specimens). Exchange. (D. 11407, 11596.)

Woman's College, Baltimore: Cambrian fossils (12 specimens). Exchange. (D. 11610.)

Massachusetts.

Bangs, Outram, Boston: Mammal skulls (10 specimens); 73 alcoholic specimens of mice; 1 skull of mink. Lent for study. (D. 11482, 11716, 11758, 11930.)

Botanical Gardens, Cambridge: Miscellaneous plants (29 specimens). Exchange. (D. 11408.)

Dale, T. Nelson, Williamstown: Minerals (54 specimens). Exchange. (D. 11887.)

Davenport, George E., Medford: Plant (1 specimen). Exchange. Mounted plants (61 specimens). Lent for study. (D. 11466, 11590, 11683.)

Eastman, C. R., Cambridge: Four plates of *Arthrodirex* and part of cranium of *Dinichthys pustulosus*. Lent for study. (D. 11731.)

Faxon, Walter, Cambridge: Crayfishes (3 specimens); dried crab (1 specimen). Lent for study. (D. 11257, 11357.)

Greenman, J. M., Cambridge: Mounted plants (126 specimens). Lent for study. One plant. Exchange. (D. 11524, 11525, 11774.)

Haynes, H. W., Boston: Arrowheads (13 specimens). For study. (D. 11502.)

Hough, Garry de N., New Bedford: Diptera (70 specimens). Exchange. (D. 11885.)

Massachusetts—Continued.

Howe, Reginald Heber, jr., Cambridge: Frogs. (34 specimens). Lent for study. (D. 11864.)

Hyatt, A., Cambridge: Fossil nautiloids (2 specimens). Lent for study. (D. 11746.)

Museum of Comparative Zoology, Cambridge: Collection of crabs; fishes (*Phycis regius*) (2 specimens); crabs (7 specimens). Exchange. One bird skin. Lent for study. (D. 11387, 11672, 11734, 11918.)

Robinson, B. L., Cambridge: Plants (514 specimens). Lent for study. Plants (293 specimens). Exchange. (D. 11187, 11611, 11713, 11851.)

Sargent, C. S., Jamaica Plain: Miscellaneous plants (11 specimens). Exchange. (D. 11454.)

Sornborger, Jewell D., Cambridge: One white-footed mouse. Lent for study. (D. 11875.)

Williams College, Williamstown: Minerals (30 specimens). Exchange. (D. 11815.)

Michigan.

Agricultural Experiment Station, Agricultural College: Plants (4 specimens). Exchange. (D. 11956.)

High School, Menominee: Rocks and ores (104 specimens, set 31). Gift. (D. 11752.)

Hubbard, Lucius L., Houghton: Minerals (2 specimens). Exchange. (D. 11933.)

Minnesota.

Bethlehem Academy, Faribault: Marine invertebrates (300 specimens, Series VI, set 49). Gift. (D. 11718.)

Heller, A. A., Minneapolis: One plant. Lent for study. (D. 11638.)

High School, Slayton: Marine invertebrates (315 specimens, Series VI, set 2). Gift. (D. 11381.)

Missouri.

Bayley, Mrs. A. V., Clarence: Mineralogical specimens. For study. (D. 11612.)

LaSalle Institute, Glencoe: Marine invertebrates (312 specimens, Series VI, set 8). Gift. (D. 11431.)

Long, M. E., Kansas City: Stone implements (133 specimens). Exchange. (D. 11161.)

Missouri—Continued.

- Missouri Botanical Gardens, St. Louis: Miscellaneous plants (3 specimens). Exchange. (D. 11410.)
- Trelease, William, Missouri Botanical Gardens, St. Louis: Lemnaceæ (138 specimens); 268 herbarium specimens. Lent for study. (D. 11183, 11286.)

Montana.

- Public schools, Phillipsburg: Marine invertebrates (318 specimens, Series VI, set 37). Gift. (D. 11546.)

Nebraska.

- Fremont Normal School, Fremont: Marine invertebrates (318 specimens, Series VI, set 44). Gift. (D. 11615.)
- Normal School, Wayne: Marine invertebrates (318 specimens, Series VI, set 47). Gift. (D. 11710.)
- Ward, H. B., Lincoln: Helminthological specimens (5 bottles). Lent for study. (D. 11727, 11831.)

New Hampshire.

- Grout, A. J., Plymouth: Plants (199 pockets). Lent for study. (D. 11499.)

New Jersey.

- Ortmann, A. E., Princeton: Fossils (23 specimens). Lent for study. (D. 11360.)

New York.

- American Museum of Natural History, New York: Philippine birds (65 specimens). Exchange. Red squirrels (196 specimens). Lent for study. Plaster cast of the "Temple of the Cross" at Palenque. Gift. (D. 11309, 11802, 11719.)
- Bailey, L. H., Cornell University, Ithaca: Plants (388 specimens). Lent for study. (D. 11282, 11785.)
- Beun, T. H., New York Aquarium, New York: Fishes. Lent for study. (D. 11579.)
- Beutenmuller, William, New York: Moths (8 specimens). Lent for study. (D. 11462.)
- Biological Laboratory, Cold Spring, Long Island: Marine invertebrates (328 specimens, Series V, set 98). Gift. (D. 11908.)
- Boys' High School, New York: Marine invertebrates (306 specimens, Series VI, set 60.) Gift. (D. 11960.)

New York—Continued.

- Britton, Mrs. Elizabeth G., New York: Moss (9 pockets). Lent for study. (D. 11656.)
- Britton, N. L., Columbia University, New York: Plants (94 specimens); violets, mounted (77 specimens). Lent for study. (D. 11229, 11295, 11886.)
- Burgess, Edward S., New York: Herbarium specimens (483). Lent for study. (D. 11483.)
- Chapman, Frank M., New York: Bird skins (7 specimens). Lent for examination. (D. 11333.)
- Columbia University, New York: Fossil plants (54 specimens); plants (62 specimens). Exchange. (D. 11652, 11951.)
- Morgan, Mons. Jacques de, New York: Original stone implements (208 specimens); arrowheads and spearheads (141 specimens). Exchange. (D. 11173.)
- Fabius Union School, Fabius: Marine invertebrates (312 specimens, Series VI, set 29). Gift. (D. 11479.)
- Froelick, F. W., New York: Chips of eruptive rocks. For examination. (D. 11842.)
- High School, Norwich: Marine invertebrates (306 specimens, Series VI, set 59); rocks and ores (104 specimens, set 27). Gift. (D. 11925.)
- Hulst, George D., Brooklyn: Moths (50 specimens). Exchange. (D. 11756.)
- Kemp, J. F., New York: Specimens of vein rocks. Exchange. (D. 11513.)
- Kunz, George F., New York: Ten specimens of jade and nephrite. Exchange. (D. 11938.)
- New York Botanical Garden, New York: Plants (907 specimens). Exchange. (D. 11639.)
- New York Collegiate Institute, New York: Marine invertebrates (312 specimens, Series VI, set 23). Gift. (D. 11451.)
- Osborn, H. F., New York: Two teeth of *Coryphodon*. Lent for study. (D. 11772.)
- Ottolengui, R., New York. Moths (9 specimens). Lent for study. (D. 11266.)
- Public Schools, Ithaca: Marine invertebrates (309 specimens, Series VI, set 58); rocks and ores (104 specimens, set 28). Gift. (D. 11910.)

New York—Continued.

- Ries, Heinrich, New York: Clays and kaolins (25 specimens). For examination. (D. 11696.)
- Rowlee, W. W., Ithaca: Plants (126 specimens). Lent for study. (D. 11637, 11784.)
- Rydberg, P. A., Brooklyn: Plants (154 specimens). Lent for study. (D. 11338, 11573.)
- Small, John K., Herbarium, Columbia University, New York: Plants (767 specimens). Lent for study. (D. 11107, 11402, 11606, 11872.)
- Snow, Charles H., New York: Six photographs of wood bored by crustaceans. (D. 11574.)
- Underwood, L. M., New York: Plants (6 specimens). Lent for study. Plants (3 specimens). Exchange. (D. 11691.)
- University of the City of New York, New York: Ethnological material (57 specimens); zinc metallurgical series (12 specimens); marine invertebrates (529 specimens, Series V, set 46); sample of wood bored by *Chelura terebrans* with specimens of the latter. Gift. (D. 11079, 11645.)

North Carolina.

- Ashe, W. W., Raleigh: Plants (67 specimens). Lent for study. (D. 11205.)
- Beadle, C. D., Biltmore: Plants (68 specimens). Lent for study. (D. 11541.)
- Biltmore Herbarium, Biltmore: Plants (327 specimens). Exchange. (D. 11949.)
- Elon College, Elon College P. O.: Marine invertebrates (318 specimens, series VI, set 50); casts of stone implements (99 specimens, set 61). Gift. (D. 11736.)
- Wake Forest College, Wake Forest: Marine invertebrates (312 specimens, series VI, set 17). Gift. (D. 11445.)

Ohio.

- Herriek, Francis H., Cleveland: Alpheidae (857 specimens). Lent for study. (D. 11730.)
- High School, Lewistown: Rocks and ores (104 specimens, set 38). Gift. (D. 11406.)
- Hine, Joseph S., Columbus: Insects (8 specimens). Lent for study. (D. 11236.)

Ohio—Continued.

- North High School, Columbus: Marine invertebrates (312 specimens, series VI, set 19). Gift. (D. 11447.)

Pennsylvania.

- Carnegie Museum, Pittsburg: Mold of *Octopus* sp. Lent for study. (D. 11265.)
- Crawford, J. G., Wilkensburg: Foraminifera (4 vials). Lent for study. (D. 11881.)
- Dickinson College, Carlisle: Marine invertebrates (312 specimens, series VI, set 20). Gift. (D. 11448.)
- High School, Greensburg: Marine invertebrates (318 specimens, series VI, set 35). Gift. (D. 11509.)
- Philadelphia Academy of Sciences, Philadelphia: Miscellaneous plants (7 specimens). Exchange. (D. 11409.)
- Public Schools, Reynoldsville: Marine invertebrates (312 specimens, series VI, set 30). Gift. (D. 11480.)
- Rhoads, S. N., Philadelphia: Skin of chipmunk; 7 skulls of otter. Lent for study. (D. 11580, 11655.)
- Rush, W. H., U. S. N., Philadelphia: Shells (569 specimens). Exchange. (D. 11438.)
- Stone, Witmer, Philadelphia: Bird skins (25 specimens). Lent for examination. (D. 11210.)
- The Western Philadelphia Historical Society, Bellevue: Stone implements (137 specimens); plaster casts of stone implements (16 specimens); 18 strings of beads. Exchange. (D. 11488.)
- University of Pennsylvania, Philadelphia: Fishes (59 specimens); marine invertebrates (465 specimens, series V, set 51); sponges from Florida and Nassau. Gift. (D. 11293, 11677.)
- Wagner Free Institute of Science, Philadelphia: Marine invertebrates (440 specimens, series V, set 52). Gift. (D. 11814.)

Rhode Island.

- Brown University, Providence: Bird skins (2 specimens). Exchange. (D. 11521.)

South Carolina.

- Manigault, G. E., Charleston: Figure of negro boy. Exchange. (D. 11723.)
- Wayne, Arthur T., Mount Pleasant: Bird skin. Exchange. (D. 11093.)

South Carolina—Continued.

Winthrop Normal and Industrial College, Rock Hill: Marine invertebrates (318 specimens, series VI, set 38). Gift. (D. 11560.)

Tennessee.

University of Tennessee, Knoxville: Casts of prehistoric implements (99 specimens); marine invertebrates (448 specimens, series V, set 48). Gift. (D. 11351.)

Texas.

Mearns, Dr. E. A., U. S. Army, Fort Clark: Mammal skins and skulls (421 specimens); bird skins (96 specimens). Lent for study. (D. 11659, 11660.)

University of Texas, Austin: Plants (2 specimens). Exchange. (D. 11633.)

Utah.

Jones, Marcus E., Salt Lake City: Plants (346 specimens). Exchange. (D. 11453, 11942.)

Vermont.

Stickney, W. B. A., Woodstock: Plants (19 specimens). Exchange. (D. 11849.)

Virginia.

Bridgewater College, Bridgewater: Marine invertebrates (312 specimens, series VI, set 13). Gift. (D. 11457.)
 Stephens City Academy, Stephens City: Marine invertebrates (309 specimens, series VI, set 26). Gift. (D. 11463.)
 Surber, Thaddeus, White Sulphur Springs: Skins and skulls of *Spinocephalus franklini* and *Sciurus alberti*. Exchange. (D. 11365.)

Washington.

Puget Sound University, Tacoma: Marine invertebrates (452 specimens, series V, set 47). Gift. (D. 11284.)
 Whitman College, Walla Walla: Marine invertebrates (315 specimens, series VI, set 42). Gift. (D. 11614.)

Wisconsin.

High School, Evansville: Rocks and ores (104 specimens, set 33). Gift. (D. 11709.)

High School, Marinette: Rocks and ores (104 specimens, set 41). Gift. (D. 11348.)

High School, Sparta: Rocks and ores (104 specimens, set 48). Gift. (D. 11149.)

Wisconsin—Continued.

Milwaukee Public Museum, Milwaukee: Bird skins (21 specimens). Lent for study. (D. 11121.)

West Division High School, Milwaukee: Marine invertebrates (312 specimens, series VI, set 12). Gift. (D. 11432.)

Whitewater High School, Whitewater: Marine invertebrates (312 specimens, series VI, set 14). Gift. (D. 11433.)

Wyoming.

Wyoming Collegiate Institute, Big Horn: Rocks and ores (104 specimens, set 38). Gift. (D. 11474.)

SOUTH AMERICA.

ARGENTINA.

Ruscherveyh, G., Buenos Aires: Lepidoptera (75 specimens). Exchange. (D. 11400.)

ASIA.

INDIA.

Indian Museum, Calcutta: Bird skins (54 specimens). Exchange. (D. 11520.)

Royal Botanic Gardens, Bengal: Plants (188 specimens). Exchange. (D. 11961.)

JAPAN.

Imperial Fisheries Bureau, Tokyo: Lucernarians (6 specimens). Exchange. (D. 11650.)

University of Tokyo, Tokyo: Marine invertebrates (444 specimens, Series V, set 50); Lamprey eels (4 specimens). Gift. (D. 11458, 11694.)

EUROPE.

AUSTRIA.

Imperial Royal Natural History Hofmuseum, Vienna: Lower Cretaceous fossils (41 specimens). Exchange. (D. 11603.)

Wohlgemuth, Karl, Bozen, South Tyrol: Ethnological specimens (13). Exchange. (D. 11669.)

DENMARK.

Meinert, F., Zoological Museum, Copenhagen: Specimens belonging to the genus *Pycnogonida*. Lent for study. (D. 11347.)

Zoological Museum, Copenhagen: 22 specimens of *Pycnogonida*. Exchange. (D. 11347.)

FRANCE.

Cossmann, M., Paris: Fossils (6 specimens). Lent for study. Shells (149 specimens). Exchange. (D. 11779, 11890.)

Koehler, R., Lyons: Collection of Echinoderms (52 specimens). For study. (D. 11095.)

Michaels, J. Porter, Paris: Human teeth from mounds and burial places (39 specimens). Lent for study. (D. 11378.)

GERMANY.

Botanical Museum, Berlin: Plants (135 specimens). Exchange. (D. 11948.)

Frobenius, L., Leipzig: Pottery (21 specimens). Exchange. D. 11624.)

Helmolt, Dr., Leipzig: Photograph of model of the Tower of Babel. (D. 11581.)

Paleontological Museum of the Royal Academy, Munich: Cambrian fossils (16 specimens). Exchange. (D. 11621.)

GREAT BRITAIN.

ENGLAND.

Baker, E. G., London: Mounted plants (2 specimens). Lent for study. Plants (16 specimens). Exchange. (D. 11687.)

British Museum, London: Dried plants (700 specimens). Exchange. (D. 11891.)

Durant, J. Hartley, Thetford: Insects. Lent for study. (D. 11324.)

Lovett, Edward, Croydon: Casts of bow-drill handles. Exchange. (D. 11456.)

Manchester Museum, Manchester: Specimen of *Pentacrinus decorus*. Exchange. (D. 11359.)

Moses, W., Ashton-under-Lyne: Alcoholic mollusks (8 specimens). For study. (D. 11762.)

Owens College, Manchester: Collection of Cephalopods. Lent for study. (D. 11369.)

Royal Botanic Gardens, Kew: Seeds of Mexican plants (31 packages). Exchange. Plants (52 specimens); 3 unmounted plants and 2 photographs; 5 mounted plants and 1 colored drawing. Lent for study. (D. 11367, 11523, 11922.)

SCOTLAND.

Museum of University College, Dundee: Marine invertebrates (448 specimens, Series V, set 49). Gift. (D. 11424.)

ITALY.

Zoological Museum, Turin: American water crustaceans (54 specimens). Exchange. (D. 11086.)

NETHERLANDS.

Ethnological Museum, Leyden: Plaster cast of patu-patu. Gift. (D. 11625.)

de Meyera, Johannes C. H., Amsterdam: Insects (366 specimens). Exchange. (D. 11468.)

NORWAY.

Geological Survey, Christiania: Selenite crystal. Exchange. (D. 11625.)

RUSSIA.

Branicki Museum, Warsaw: Bird skins (170 specimens). Exchange. (D. 11110.)

Melnikoff, M., St. Petersburg: Specimen of meteorite. Exchange. (D. 11675.)

Zoological Museum of the Imperial Academy of Sciences, St. Petersburg: Shells (2024 specimens). Exchange. (D. 11085.)

SWEDEN.

Natural History Museum of the Academy of Sciences, Stockholm: Fishes (15 specimens). Exchange. (D. 11082.)

Royal Museum of Natural History, Stockholm: Actinians (62 specimens). Exchange. (D. 11808.)

SWITZERLAND.

Museum of Natural History, Geneva: Crustacea (46 specimens). Exchange. (D. 11184.)

OCEANICA.

AUSTRALIA.

New South Wales, Ogilby, J. Douglas, Sydney: Fishes (9 specimens). Exchange. (D. 11626.)

APPENDIX IV.

BIBLIOGRAPHY OF THE U. S. NATIONAL MUSEUM FOR THE YEAR ENDING JUNE 30, 1898.

PUBLICATIONS OF THE MUSEUM.¹

ANNUAL REPORT.

Annual Report | of the | Board of Re-
gents | of the | Smithsonian Institu-
tion, | Showing | the Operations, Ex-
penditures, and Condition | of the In-
stitution | for the | year ending June

30, 1895. | — | Report | of the | U. S. Na-
tional Museum. | — | Washington: |
Government Printing Office. | 1897.
8vo, pp. 1-xx, 1-1030, 156 pls., 382 figs.

PROCEEDINGS.

Smithsonian Institution. | United States
National Museum, | — Proceedings |
of the | United States National Mu-
seum. | — | Volume XIX. | — | Published

under the direction of the Smithso-
nian Institution. | — | Washington:
| Government Printing Office. | 1897.
8vo, pp. 1-viii, 1-864, pls. 1-lxviii, 53 figs.

BULLETIN.

Smithsonian Institution. | United States
National Museum. — Directions for col-
lecting and preserv | ing Scale Insects
(Coccidae). | By | T. D. A. Cockerell, |
Entomologist of the New Mexico Agri-
cultural Experiment Station. | — | Part

L of Bulletin of the United States Na-
tional Museum, No. 39. | — | Washing-
ton: | Government Printing Office. |
1897.
8vo. pp. [1]—[9].

PAPERS BY OFFICERS OF THE NATIONAL MUSEUM AND OTHERS, BASED UPON MUSEUM MATERIAL.

AGASSIZ, ALEXANDER. Reports on the
dredging operations off the west coast
of Central America to the Galapagos, to
the west coast of Mexico, and in the
Gulf of California, in charge of Alexan-
der Agassiz, carried on by the U. S. Fish
Commission steamer *Albatross*, during
1891, Lieut. Commander Z. L. Tanner,
U. S. Navy, commanding. XXIII.—Pre-
liminary report on the *Echini*.

Bull. Mus. Comp. Zool., Harvard College,
xxxii, No. 5, June, 1896, pp. 71-86, pls.
1-xiii and pl. A.

Five new genera and 24 new species are
described and figured, the descriptions being
prefaced by general remarks on the distribu-
tion of Pacific *Echini*.

ANTHONY, A. W. Two new birds from
the Pacific coast of America.

Auk, xv, No. 1, Jan., 1898, pp. 36-38.
Anous stolidus ridgwayi and *Oceanodroma*
kædingi are described as new.

— Four sea birds new to the fauna
of North America.

Auk, xv, No. 1, Jan., 1898, pp. 38-39.
The following species, new to the avifauna
of North America, are announced from the
coast of Lower California: *Diomedea immu-*
tabilis, *Puffinus auricularis*, *P. cuneatus*, and
Phæthon rubricaudus.

ASHMEAD, WILLIAM H. Descriptions
of two new fossorial wasps.

Psyche, viii, Oct., 1897, pp. 129-130.
Describes *Asitata leuthstromi* and *Ptenoculus*

¹The titles of the papers from the Report, Proceedings, and "parts" of Bulletins which were pub-
lished in separate form during the year are given in Appendix V.

ASHMEAD, WILLIAM H.—Continued.

peckhami. The types are in the National Museum.

- Notes on some European Hymenopterous parasites of the Hessian-fly, *Cecidomyia destructor* Say, and other insects, bred by Dr. Paul Marchal, the French Government entomologist.

Psyche, VIII, Nov., 1897, pp. 135-138.

Records the hosts of 13 species of parasites bred by Dr. Paul Marchal, and describes 2 new species, *Baetomus coxalis* and *Holcoecus cecidomyia*.

- Description of five new genera in the Cynipidæ.

Canadian Entomologist, XXIX, Nov., 1897, pp. 260-263.

Describes *Xystoteras*, n. g., type *X. volutella*; *Zopheroteras*, n. g., type *Biorrhiza forticornis* Walsh; *Parateras*, n. g., type *hubbardi*, n. sp.; *Asclepiadiphila*, n. g., type *stephanotidis*, n. sp.

- An egg parasite of *Smerinthus astylus* Drury.

Ent. News, IX, Jan., 1898, p. 124.

Describes *Anastatus pearskalli*, n. sp.

- Description of five new Hymenopterous parasites on *Canarsia hammondi* Riley.

Proc. Ent. Soc. Wash., IV, 1898, No. 2, pp. 124-131.

Describes and figures *Spilocryptus canarsia*, *Limmeria* (*Sinophorus*) *canarsia*, *Apanteles canarsia*, *Elasmus meteori* and *Tetrastichus coeruleus*.

- A new species of *Roptronia*.

Proc. Ent. Soc. Wash., IV, 1898, No. 2, pp. 132, 133.

Describes *Roptronia garmani*, n. sp., and gives a table of the known species, in which another species from California is characterized under the name *R. californica*.

- [Table of the genera of the Xyelidæ.]

Psyche, VIII, May, 1898, p. 214.

This is a table of the genera of the family Xyelidæ furnished to Dr. H. G. Dyar for his MS., in which two new genera, *Megazyela* and *Manozyela* are characterized. The types are in the National Museum.

- Classification of the Horntails and Sawflies, or the suborder Phytophaga.

Canadian Entomologist, XXX, June, 1898, pp. 141-145.

In this contribution, which represents No. 1 of the series, the author separates these

ASHMEAD, WILLIAM H.—Continued.

insects into 15 distinct families, and gives dichotomous tables for their recognition.

(See also under GEORGE DIMMOCK.)

- BANGS, OUTRAM. On some birds from Santa Marta, Colombia.

Proc. Biol. Soc. Wash., XII, June 3, 1898, pp. 131-144.

A briefly annotated list of 134 species obtained in the Santa Marta region of Colombia, of which the following are new: *Galbula ruficauda pollens*, *Melanerpes wagleri sancta-martae*, *Dendrocincla olivacea anguina*, *Sycalis browni*, *Cyanococcyz conereta sancta-martae*, *Arremonops contrivirois canens*, *Piranga faceta*, *Cyclarhis flavipectus cantius*, *Dacnis napea* and *Merula incompta*.

- BARTSCH, PAUL. *Urta lomvia*. An addition to the Avifauna Columbiana.

Auk, XIV, No. 3, July, 1897, pp. 312, 313.

The taking of 6 specimens of this species on the Potomac near Washington is here recorded. This record adds the family Alcidae to the Avifauna Columbiana.

- A few notes on the Avifauna Columbiana.

Auk, XIV, No. 3, July, 1897, p. 326.

Notes on the occurrence of *Elanoides forficatus* and *Geothlypis agilis*. An early breeding date of *Cathartes aura* (in the spring of 1897) is here mentioned.

- Summer birds of the Oneota Valley.

Iowa Ornithologist, III, No. 4, Oct., 1897, pp. 51-62.

A paper read at the Third Congress of the Iowa Ornithological Association, discussing the birds observed on the expedition to the Oneota Valley in the summer of 1895. A list of 98 species, with copious notes under each, follows the general discussion of the surface features and climatic conditions of the region.

- The breeding of the Carolina Parquet in captivity by Dr. Nowatny.

Auk, XV, No. 1, Jan., 1898, pp. 28-32.

Translation of a letter by Dr. Nowatny in "Die Freundlandischen Stubenvogel ihre Naturgeschichte, Pflege und Zucht." (Vol. III, Pt. 10, p. 838 et seq.)

- An early morning ramble in autumn in the will-be Potomac Park.

Bull. Wilson Ornithological Chapter of the Agassiz Association, No. 18, Jan., 1898, pp. 1-2.

This paper gives an account of a visit to the park on October 2, 1897, with notes on the fauna and flora.

BEAN, BARTON A.

(See under TABLETON H. BEAN.)

BEAN, TARLETON H. Notes on Mexican fishes obtained by Dr. Carl Lumholtz.

Bull. Amer. Mus. Nat. Hist., x, May 7, 1898, pp. 165-168.

BEAN, TARLETON H., and BARTON A. Description of a new blenny-like fish of the genus *Opisthocentrus*, collected in Vulcano Bay, Port Mororan, Japan, by Nicolai A. Grebnitski.

Proc. U. S. Nat. Mus., xx, No. 1127, pp. 463, 464, pl. xxxv.

BENEDICT, JAMES E. A revision of the genus *Synidotea*.

Proc. Acad. Nat. Sci. Phila., 1897, pp. 389-404, figs. 1-13.

Of the 15 species referred to the genus *Synidotea*, 7 are described as new and 12 are in the National Museum collection. The species are distributed chiefly in the North Pacific and Arctic oceans, though a few are from the North Atlantic and South African oceans. The bathymetrical range is from shallow water to 605 fathoms.

— The *Arcturidae* in the U. S. National Museum.

Proc. Biol. Soc. Wash., xii, Mar. 24, 1898, pp. 41-51, figs. 3-11.

Twenty-five species are recognized in the genus *Arcturus*, 6 of which are new. Two new species of *Astaotilla* are described, 1 of which is a blind form from deep water off Marthas Vineyard.

— Two new Isopods of the genus *Idotea*, from the coast of California.

Proc. Biol. Soc. Wash., xii, Mar. 24, 1898, pp. 53-55, figs. 12, 13.

The species described belong to *Idotea* as defined by Miers. *Idotea rostrata*, n. sp., together with *I. carinata* Lucas, may, however, eventually form a distinct genus.

BERNARD, FELIX. Anatomie de *Chlamydoconcha orcutti* Dall, lamellibranche à coquille interne.

Ann. Sci. Nat., Zoologie, 8me ser., iv, Paris, 1897, pp. 221-252, pls. 1, 2.

This paper is based upon dissections of a duplicate specimen of the species mentioned, furnished by the Division of Mollusks. The original types of the species form part of the national collection.

BOAS, FRANZ. The social organization and the secret societies of the Kwakintl Indians.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1895 (1897), pp. 311-738, pls. 1-51, figs. 1-215.

BUSH, KATHARINE JEANNETTE. Revision of the marine Gastropods referred to *Cyclostrema*, *Adorbis*, *Vitri-nella*, and related genera, with descriptions of some new genera and species belonging to the Atlantic fauna of America.

Trans. Conn. Acad. Sci., x, July, 1897, pp. 97-144, pls. xxii, xxiii.

This paper, the scope of which is indicated by its title, is based in large part on deep-sea material collected by the U. S. Fish Commission, and now belonging to the National Museum.

(See also under A. E. VERRILL.)

CANTWELL, GEORGE G. Notes on the egg of the Marbled Murrelet.

Auk, xv, No. 1, Jan., 1898, p. 49.

Reference is made to an egg of this species which was removed from a dead bird. The egg is described by Dr. W. L. Ralph.

CHAPMAN, FRANK M. Preliminary descriptions of new birds from Mexico and Arizona.

Auk, xiv, No. 3, July, 1897, pp. 310, 311.

Contopus pertinax pallidiventris, from Arizona, and *Coccothraustes vespertinus mexicanus*, from Mexico, are described as new. The name *Spinus pinus macroptera* (DuBus) is used to distinguish the Mexican form of the Pine Siskin.

CHITTENDEN, FRANK H. Notes on certain species of Coleoptera that attack useful plants.

Bull. Div. Ent., U. S. Dept. Agric., No. 9 (New series), Oct. 21, 1897, pp. 20-24.

Records of new food plants and of biological facts concerning certain species of Coleoptera, chiefly Chrysomelidae.

— On the parasites of adult Coleoptera.

Proc. Ent. Soc. Wash., iv., Jan. 12, 1898, pp. 75-79.

Mention of certain species of parasitic Hymenoptera and Diptera (belonging to the families Sarcophagidae, Braconidae, Chalcididae, and Tachinidae), which affect the adults of some species of Coleoptera.

— The Celery Leaf-tyer, *Phlyctania ferrugalis* Hbn.

Weekly Florists' Review, i, Mar. 3, 1898, pp. 571, 572.

A popular account given in answer to a correspondent.

— Notes on Cucumber Beetles.

Bull. Div. Ent., U. S. Dept. Agric., No. 10 (New series), Mar. 26, 1898, pp. 26-31.

The species considered are *Diabrotica vittata* and *D. 12-punctata*.

CHITTENDEN, FRANK H.—Continued.

— Insects that affect Asparagus.

Bull. Div. Ent., U. S. Dept. Agric., No. 10
(New series), Mar. 26, 1898, pp. 54-62.

Notes on *Crioceris asparagi*, *C. 12-punctata*,
Diabrotica 13-punctata, with shorter notes on
about twenty other species of insects observed
on asparagus.

— The Bean Leaf-beetle, *Cerotoma trifurcata* Forst.

Bull. Div. Ent., U. S. Dept. Agric., No. 10
(New series), Mar. 26, 1898, pp. 64-71.

A detailed general account of this species
with original observations, including descrip-
tions of the egg and larva.

— The Tobacco Flea-beetle, *Epitrix parvula* Fab.

Bull. Div. Ent., U. S. Dept. Agric., No. 10
(New series), Mar. 26, 1898, pp. 79-82.

Observations upon the biology of this spe-
cies, with a review of its economic literature
and a brief description of its different stages.

— A little-known Tineid moth of in-
door habits.

Bull. Div. Ent., U. S. Dept. Agric., No. 10
(New series), Mar. 26, 1898, pp. 90, 91.

A note on the occurrences of *Monopis (Tinea)*
ferruginella indoors; its habits, appearance,
and distribution.

— Another moth likely to be mistaken
for *Tinea granella*.

Bull. Div. Ent., U. S. Dept. Agric., No. 10
(New series), Mar. 26, 1898, p. 91.

A short note on *Tinea misella*.

— Parasites of bean and cowpea
weevils.

Bull. Div. Ent., U. S. Dept. Agric., No. 10
(New series), Mar. 26, 1898, p. 94.

Mentions *Eupelmus cyaneiceps*, *Bruchobius*
laticollis, *Cephalonomia* sp., and *Aplastomor-*
pha prattii.

— The Fruit-tree Bark-beetle, *Scolytus rugulosus* Ratz.

Circ. Div. Ent., U. S. Dept. Agric., No. 29
(Second series), Mar. 30, 1898, pp. 1-8.

A popular economic account with some
original observations.

— The Striped Cucumber Beetle,
Diabrotica vittata Fab.

Circ. Div. Ent., U. S. Dept. Agric., No. 31
(Second series), May 5, 1898, pp. 1-7.

A popular economic consideration of this
species, with special attention to methods of
control.

— The larger apple-tree borers.

Circ. Div. Ent., U. S. Dept. Agric., No. 32
(Second series), June, 1898, pp. 1-11.

CHITTENDEN, FRANK H.—Continued.

A general consideration of *Saperda candida*,
S. cretata, and *Chrysobothris femorata*, with
particular attention to remedial treatment.

COCKERELL, T. D. A. The food plants
of scale insects (Coccidæ).

Proc. U. S. Nat. Mus., xix, No. 1122. Aug.
2, 1897, pp. 725-785.

— Directions for collecting and pre-
serving scale insects (Coccidæ).

Bull. U. S. Nat. Mus., No. 39, Pt. I, 1897,
pp. [1]-[7].

COOK, O. F. On *Anodontostoma*.

Brandtia, Nov., 1897, pp. 61-63.

Emends the original descriptions of Haae
and recognizes *Anodontostoma* and *Alipes* as
types of distinct families of Chilopoda.

— New Gomphodesmidae.

Brandtia, Nov., 1897, pp. 65-67.

Synopsis of subfamilies and genera, seven
of the latter being new.

— The species of *Alipes*.

Brandtia, Nov., 1897, pp. 69-72.

Unites *Alipes grandidiera* Lucas, *A. crotalus*
Gerstaecker and *A. multicostis* Imhoff, and de-
scribes 3 new species. Also contains a note
on the stridulating organs of this aberrant
Chilopod.

— New relatives of *Spirobolus giganteus*.

Brandtia, Nov., 1897, pp. 73-75.

Describes 6 new species under the new
genus *Pachybolus*, all from tropical Africa.
Following is a synopsis of allied African
genera, of which 3 are new.

— A revision of tropical African Dip-
lopoda of the family Strongylosoma-
tidae.

Proc. U. S. Nat. Mus., xx, 1898, pp. 695-708.

Descriptions of the 6 genera and 14 species
thus far known, of which 3 genera and the
same number of species are new.

COQUILLET, D. W. Revision of the
Tachinidae of America north of Mexico.

Bull. Div. Ent., U. S. Dept. Agric. (Tech-
nical series), No. 7, Oct., 1897, 156 pp.

This paper treats of the habits of these in-
sects and gives a list of the insect hosts of
the bred species, together with a description
of the species represented in the National
Museum. Describes 11 new genera and 90
new species.

— On *Cuterebra emasculator*, with de-
scriptions of several allied species.

Canadian Entomologist, xix, Jan., 1898,
pp. 9-11.

Describes 5 new species.

COQUILLET, D. W.—Continued.

- The Buffalo-gnats or Black-flies of the United States.

Bull. Div. Ent., U. S. Dept. Agric., No. 10 (New series), Mar., 1898, pp. 66-69.

A brief account of the habits of these flies, together with a synoptic table of the species, two of which are new.

- On the habits of the Oscinidæ and Agromyzidæ reared at the U. S. Department of Agriculture.

Bull. Div. Ent., U. S. Dept. Agric. (New series), No. 10, pp. 70-79.

Records the breeding habits of 36 species.

- Notes and descriptions of Oscinidæ.

Journ. N. Y. Ent. Soc., vi, Mar., 1898, pp. 44-49.

Gives a synoptic table of the 13 genera, one of which is new, and describes 13 new species.

COVILLE, FREDERICK VERNON. Notes on the plants used by the Klamath Indians of Oregon.

Contrib. U. S. Nat. Herbarium, v, June 9, 1897, pp. 87-108.

- Observations on recent cases of mushroom poisoning in the District of Columbia.

Circ. Div. Botany, U. S. Dept. Agric., No. 13, Dec. 1, 1897, 21 pp., with fig. Rev. ed., Jan. 4, 1898, 24 pp., fig. 27.

- The Shasta Fir, *Abies shastensis*.

Garden and Forest, x, Dec., 1897, p. 516.

- Forest growth and sheep grazing in the Cascade Mountains of Oregon.

Bull. Div. Forestry, U. S. Dept. Agric., No. 15, 1898, 54 pp.

CULIN, STEWART. American Indian games.

Bull. Mus. Science and Art, Univ. Pa., i, No. 3, pp. 1-15, 9 illus.

CURRIE, ROLLA P. New species of North American Myrmelionidæ. 1.

Canadian Entomologist, xxx, Apr., 1898, pp. 93-96.

Describes *Brachynemurus coquilleti*.

- New species of North American Myrmelionidæ. 2.

Canadian Entomologist, xxx, May, 1898, pp. 134-140.

Describes *Brachynemurus niger* and *B. quadripunctatus*.

DALL, WILLIAM HEALEY. Alaska and the new gold fields.

DALL, WILLIAM HEALEY—Continued.

Forum, Sept., 1897, pp. 16-26.

A summary of the meteorological, geographical, and geological conditions in the region referred to.

- Synopsis of the Pinnidæ of the United States and West Indies.

Nautilus, xi, No. 3, July, 1897, pp. 25, 26.

This paper contains a revision of the nomenclature and a list of the species.

- Notes on land shells from the Malay Peninsula.

Nautilus, xi, No. 4, Aug., 1897, pp. 37, 38.

A short list of species collected by Dr. W. L. Abbott. One species, *Nanina (Macrochlamys) diadema*, is described as new.

- On a new *Holospira* from Texas.

Nautilus, xi, No. 4, Aug., 1897, p. 38.

Holospira (Haplostemma) hamiltoni, from Brewster County, is described as new.

- Glimpses of southern Oregon.

Nation, New York, LXV, Sept. 9, 1897, pp. 201, 202; Sept. 16, 1897, pp. 221, 222.

A brief summary of topographical and sociological features of the region mentioned.

- Letter to the editor.

Science (New series), vi, No. 147, Oct. 22, 1897, pp. 633, 634.

A letter calling attention to the dangers in the use of formalin for museum purposes.

- New land shells from Mexico and New Mexico.

Nautilus, xi, No. 6, Oct., 1897, pp. 61, 62.

Holospira (Haplostemma) cockerelli (p. 61), *Eucalodium hippocastaneum* (p. 61), *Coelocentrum astrophorea* (p. 62), and *Schizicheila hidalgoana* (p. 62) are described as new.

- Editorial correspondence.

Nautilus, xi, No. 6, Oct., 1897, p. 66.

A letter summing up the shore fauna of mollusks observed by the writer at Coos Bay, Oregon.

- Notes on the paleontological publications of Prof. William Wagner.

Trans. Wagner Free Inst. Sci., v, Oct., 1897, pp. 7-11, pls. 1-III.

This paper comprises a synopsis of Professor Wagner's publications, and an explanation of three plates prepared in 1830 for Professor Wagner, but unpublished hitherto, although a few copies with manuscript names had been sent out. The following species appear to be new: *Arca virginiae* (Wagner MS.), p. 9, pl. i, fig. 3; *Arca carolinensis* (Wagner MS.), p. 9, pl. i, fig. 4; *Modiola gigas* (Wagner MS.), p. 10, pl. ii, fig. 3; *Cancellaria antiqua* (Wagner MS.), p. 11, pl. iii, fig. 3. The types of several of these species exist in

DALL, WILLIAM HEALEY—Continued.

collection of the Wagner Institute and have been generously shared with the National Museum. They are from the Chesapeake Miocene of Maryland and Virginia.

— New species of Mexican land shells.

Nautilus, xi, No. 7, Nov., 1897, pp. 73, 74.

Helia (*Lysinoë*) *queretaroana* (p. 73), *Helia* (*Lysinoë*) *sebastiana* (p. 73), *Polygyra nelsoni*, and a variety *collisella* (p. 74) are described as new. The types are in the National Museum.

— New West American shells.

Nautilus, xi, No. 8, Dec., 1897, pp. 85, 86.

Sigaretus oldroydi (p. 85), from Catalina Island, California; *Pecten palmeri* (p. 85), from the Gulf of California; *Pecten randolphi* (p. 86), from the coast of Washington, and *Pecten davidsoni* (p. 86), from Bering Sea, are described as new. The types of *Pecten* are in the National Museum.

— Notice of some new or interesting species of shells from British Columbia and the adjacent region.

Bull. Nat. Hist. Soc. British Columbia, ii, 1897, pp. 1-18, pls. 1, ii.

The following species described as new: *Orenella columbiana* (p. 4, pl. i, figs. 3, 5), *Orenella leana* (p. 4, pl. i, figs. 6-7), *Orenella japonica* (p. 5, pl. i, fig. 2), *Modiolaria taylori* (p. 5, pl. i, figs. 17, 18), *Modiolaria seminuda* (p. 5, pl. i, fig. 1), *Nucula carlottensis* (p. 6, pl. i, figs. 15, 16), *Leda cellulita* (p. 7, pl. ii, figs. 5, 7), *Leda extenuata* (p. 8, pl. ii, fig. 2), *Yoldia ensifera* (p. 9, pl. ii, fig. 4), *Yoldia martyria* (p. 9, pl. ii, fig. 15), *Malletia faba* (p. 10, pl. ii, fig. 10), *Malletia gibbsii* (p. 10, pl. 2, fig. 14), *Malletia pacifica*, *Malletia* (*Tyndaria*) *kernerleyi* (p. 11, fig. 9), *Macoma histricha* (p. 12, pl. i, fig. 21), *Oadulus hepburni* (p. 12, pl. i, fig. 18), *Oadulus tolmi* (p. 13, pl. i, fig. 8), *Cythara victoriana* (p. 13, pl. i, fig. 9), *Mumiola tenuis* (p. 13, pl. i, fig. 10), *Odotomia* (*Miralda*) *inflecta* (p. 14), *Rissoina newcombei* (p. 14, pl. i, fig. 12), *Molleria quadra* (p. 15, pl. i, figs. 14, 14a), and *Eucomia lurida* (p. 15, pl. i, fig. 11). *Yoldia scissurata* Dall (p. 8) is proposed for *Y. arctica* Brod. non Gray, and the unfigured *Modiolaria vernicosa* Midd., *Leda fessa* Baird, *Leda cellulita* Dall, *Leda leonina* Dall, and *Yoldia montereyensis* Dall, are figured. All are from the North Pacific and most of them from the northwest coast of America. The types are in the U. S. National Museum and the Colonial Museum of British Columbia.

— On a new species of *Vitrea* from Maryland.

Nautilus, xi, No. 9, Jan., 1898, pp. 100-101.

Vitrea raderi (p. 100), from Cumberland, Md., is described as new, and the varietal name *Clingmani* is proposed for the large form of *Zonites wheatleyi* Bd., from Clingman's

DALL, WILLIAM HEALEY—Continued.

Peak, North Carolina. Both types are in the National Museum.

— Florida's interesting fossils.

Florida Times-Union, Feb., 1898.

This article is contained in a special edition of the *Times-Union* devoted to the resources of the State.

The paper discusses the Tertiary fossil faunas of the State, and figures (from specimens in the National Museum) six of the most remarkable and characteristic species.

— Recent progress in malacology.

Science (New series), vii, No. 167, Mar. 11, 1898, pp. 334-337.

A summary of new facts brought out in recent malacological and paleontological papers. The term "provinculum" is suggested for the larval hinge of bivalves, recently shown by Bernard to precede the development of the regular hinge.

— How phosphate came.

Florida Times-Union, Mar. 13, 1898.

A summary of the present opinion of geologists as to the source and formation of the Floridian deposits of phosphate of lime.

— Coal and lignite.

Map of Alaska, U. S. Geol. Surv. (descriptive text), Mar., 1898, pp. 39-44.

This article is contained in the descriptive text of a map of Alaska prepared by the United States Geological Survey in accordance with a resolution of Congress. Mr. Dall gives a synopsis of our knowledge of the coal and lignite of Alaska.

— Synopsis of the recent and Tertiary Psammobidæ of North America.

Proc. Acad. Nat. Sci. Phila. for 1898, Apr. 5, 1898, pp. 57-62.

A synopsis of the species, with a revision of their generic and specific synonymy. The section *Grammatomya* with *Psammobia squamosa* as the type; *Nuttallia* with *Sanguinolaria nuttallii* as the type; and *Gurum* with *Psammobia flosa* Conrad as an example are new. The name of *P. californica* (*rubroradiata* Cpr.) is restored, and the *P. edentula*, described as a fossil *Siliquaria* by Gabb, is placed in its proper genus, and noted as occurring in the recent fauna of San Pedro, Cal.

— The future of the Yukon gold fields.

Nat. Geograph. Magazine, ix, No. 4, Apr., 1898, pp. 117-120.

A discussion of the conditions of fuel and food supply in the Yukon region.

— A Yukon pioneer, Mike Lebarge.

Nat. Geograph. Magazine, ix, No. 4, Apr., 1898, pp. 137-139.

A biographical sketch, with portrait, of a

**DIMMOCK, GEORGE, and ASHMEAD,
WILLIAM H.—Continued.**

Ashmead also gives a table of the genera of the *Microgasterinae*, in which he characterizes 6 new genera.

EASTMAN, C. R. *Tamiobatis vetustus*; a new form of fossil Skate.

Am. Journ. Sci., IV, No. 20, Aug., 1897, pp.
85-90, pl. and fig.

ELLIOT, DANIEL G. A list of a collection of shells from the Gulf of Aden.

*Pub. Field Columbian Museum, No. 26,
Zool. series 1, No. 9, Chicago, Mar., 1898,
pp. 187-189.*

This memoir forms part IV of the discussion of the Tertiary mollusk-fauna of the Gulf States and adjacent region. Nearly all the types of new species are in the National Museum. The sum of all the new names amounts to 3 genera, 1 subgenus, 8 sections, about 22 new names for species bearing names which are no longer tenable, 162 new species, and 27 varieties. These names are given in the index to the work.

**EVERMANN, BARTON WARREN, and
KENDALL, WILLIAM C.** Descriptions
of new or little-known genera and spe-
cies of fishes from the United States.

Bull. U. S. Fish Com., 1897 (Feb. 9, 1898),
pp. 125-133.

In this paper are described 8 new genera and 8 new species of fishes collected in Florida, Louisiana, and Mississippi.

EVERMANN, BARTON WARREN, and
MEEK, SETH EUGENE. A report upon
salmon investigations in the Columbia
River Basin, and elsewhere on the Pa-
cific coast, in 1896.

Bull. U. S. Fish Com., 1897 (Jan. 6, 1898),
pp. 15-84.

This paper lists 40 species, 5 of which are described as new.

FAXON, WALTER. Observations on the Astacidae in the U. S. National Museum and in the Museum of Comparative Zoology, with descriptions of new species.

Proc. U. S. Nat. Mus., xx, No. 1136, Feb. 17,
1898, pp. 643-694, pls. LXII-LXX.

The first part of the paper embodies the results of an examination of the material which has accumulated in the U. S. National Museum and the Museum of Comparative Zoology since the publication of the author's "Notes on North American Crayfishes" in 1890. The second part relates to the crayfishes of the Southern Hemisphere—the Parastacinae.

15th Ann. Rep. Bur. Am. Ethnol., 1897, pp.
245-313, pls. CIV-CXI, figs. 39-48.

An account of the masked dances at Wopli,
a Tusayan pueblo, and an attempt to explain
them.

FRIERSON, LORRAINE S. *Unio (Lamp-silis) amphichænus*, new species.

Nautilus, xi, Feb., 1898, pp. 110, 111, pl. 1.

Unio (Lampsilis) amphichænus Frierson.

Specimens of the type lot are in the National Museum collection. This specimen was collected in the Sabine River at Logansport, La.

GILBERT, CHARLES HENRY. The fishes of the Klamath River Basin.

Bull. U. S. Fish Com., 1897 (Jan. 6, 1898), pp. 1-13.

A list of 15 species, 6 of which are described as new.

GILBERT, CHARLES HENRY, and SCOFIELD, NORMAN BISHOP. Notes on a collection of fishes from the Colorado Basin in Arizona.

Proc. U. S. Nat. Mus., xx, No. 1131, Jan. 19, 1898, pp. 487-499, pls. xxxvi-xxxix.

Of the 19 species listed, 3 are described as new.

GILL, THEODORE. Oceanic Ichthyology.

Natural Science, xi, July, 1897, p. 71.

A refutation of some animadversions on Goode and Bean's "Oceanic Ichthyology" in a review published in a previous number of *Natural Science* (x, pp. 338-340).

— Edward Drinker Cope, naturalist. A chapter in the history of science.

Science (New series), vi, Aug. 13, 1897, pp. 225-243.

This biographical sketch appeared also in the *Scientific American Supplement*, the *American Naturalist*, and the *Proceedings of the American Association for the Advancement of Science*.

— On the relationships of the Nemato-gnaths.

Science (New series), vi, Aug. 13, 1897, p. 434.

— Amphibia or Batrachia.

Science (New series), vi, Sept. 17, 1897, pp. 446, 447.

It is maintained that the Linnean name Amphibia should be used as the name of the class, because it was first used as a class name and also first restricted to the class.

— The Agonoid genus *Percis* of Scopoli.

Science (New series), vi, Dec. 24, 1897, p. 958.

The name *Percis*, given by Scopoli in 1777, should supersede the name *Hippocephalus*, generally used but not published until 1839.

— The distinctive characters of the Molinæ and Ranzaniinæ.

Science (New series), vi, Dec. 24, 1897, p. 966.
The Molinæ have the skeleton mostly carti-

GILL, THEODORE—Continued.

lagnous and the dorsal and anal fins invested in the common skin, while the Ranzaniinæ have the skeleton "subosseous" and the rays distinct.

— The Crustacean genus *Scyllarides*.

Science (New series), vii, Jan. 21, 1898, pp. 98, 99.

It is shown "that the only species of *Scyllarus* known to Fabricius in 1775, when he first made known that genus, was *S. arctus*—the *Cancer arctus* of Linneus. That, being the only species, is necessarily the type, and therefore the name *Scyllarus* must be retained for it." For the *Scyllarus* of Dana and modern authors the new name *Scyllarides* is proposed.

— Huxley and his work.¹

Rep. Smithsonian Inst., 1895 (1896), pp. 759-780.

A memorial address given on Jan. 14, 1896, before the scientific societies of Washington. Reprinted, with additions, from *Science* (New series), iii, No. 60, Feb. 21, 1896.

GILL, THEODORE, and TOWNSEND, CHARLES H. Diagnoses of new species of fishes found in Bering Sea.

Proc. Biol. Soc. Wash., xi, Sept. 17, 1897, pp. 231-234.

Description of 14 new species and 1 new genus of fishes obtained by Mr. Townsend as naturalist of the U. S. Fish Commission steamer in 1895. The new species described are *Raia rosipinnis*, *Raia obtusa*, *Raia interrupta*, *Macdonaldia alta*, *Macdonaldia longa*, *Ericara salmonea*, *Lycodes digitatus*, *Lycodes concolor*, *Macrurus lepturus*, *M. dorsalis*, *M. firmisquamis*, *M. magnus*, *M. suborbitalis*, *Hippoglossoides robustus*. The new genus described is *Ericara* of Alepocephalidæ.

GILLETTE, CLARENCE P. American Leaf-hoppers of the subfamily Typhlob-cybinae.

Proc. U. S. Nat. Mus., xx, No. 1138, April 20, 1898, pp. 709-773, figs. 1-149.

GODMAN, F. D.

(See under OSBERT SALVIN.)

GOODE, G. BROWN. Report upon the condition and progress of the U. S. National Museum during the year ending June 30, 1895.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1895 (1897), pp. 1-308.

GORE, J. HOWARD.

(See under THOMAS WILSON.)

GRINNELL, JOSEPH. Description of a new Towhee, from California.

¹Omitted from the Bibliography in the last Annual Report.

GRINNELL, JOSEPH—Continued.

Auk, xiv, No. 3, July, 1897, pp. 294-296.

Pipilo clemente, from San Clemente Island, is described as new.

— New race of *Spinus tristis* from the Pacific coast.

Auk, xiv, No. 4, Oct., 1897, pp. 397-399.

Spinus tristis salicamans is described as new.

— Summer birds of Sitka, Alaska.

Auk, xv, No. 2, April, 1898, pp. 122-131.

An annotated list of 66 species found by the author in the vicinity of Sitka, Alaska.

HANSEN, H. J. Reports on the dredging operations off the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission steamer *Albatross* during 1891, Lieut. Commander Z. L. Tanner, U. S. Navy, commanding. XXII.—The Isopoda.

Bull. Mus. Comp. Zool. Harvard College, xxxi, No. 5, Dec., 1897, pp. 95-129, with 6 plates and chart.

The collection contains 15 species. Fourteen of these are marine species and are new to science. The other, a land species, is well known. Of the 14 marine species, 8 are free-living and 1 is parasitic on fishes. These 9 species belong to known genera. The remaining 5 species are peculiar forms of the subfamily Bopyrinae, and occur in the branchial cavities of deep-sea decapod crustaceans.

The chart shows the route of the *Albatross*.

HASSALL, ALBERT.

(See under C. W. STILES.)

HOFFMAN, WALTER JAMES. The graphic art of the Eskimos. (Based upon collections in the National Museum.)

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1895 (1897), pp. 739-968, pls. 1-82, figs. 1-154.

HOUGH, WALTER. The origin and range of the Eskimo lamp.

Am. Anthropologist, xi, April, 1898, No. 4, pp. 116-122.

This discussion is germane to a monograph on Eskimo lamps, which will be published later. The author points out that the Eskimo could not live without lamps, which they have possessed from time immemorial. The fact that their lamps originated from beach stones with natural concavities, and that they range from this simple form to highly finished examples of stone and pottery, shows that the

HOUGH, WALTER—Continued.

size and form of the lamps bear so distinct a relation to the isothermal lines and zone of winter darkness, that it is possible by comparison to assign the geographical position of any specimen.

— Environmental interrelations in Arizona.

Am. Anthropologist, xi, May, 1898, No. 5, pp. 133-155.

A study of the effect of environment upon the Moki and upon the plants of the region, together with their mutual interrelations. The paper contains a list of plants formerly printed, but amplified by the results of the field work of 1897.

HOWARD, LELAND O. The desirability of an inspection system against foreign insects.

Proceedings National Convention for the Suppression of Insect Pests, Washington, U. S. Dept. Agric., Aug., 1897, pp. 11, 12.

An estimate of the comparative number of imported injurious insects and a consideration of the possibilities of a quarantine and inspection system which should keep out future importations of this class.

Reviewed in the *Hawaiian Planter's Journal* for January, 1898.

— The spread of land species by the agency of man with especial reference to insects.

Science (New series), vi, No. 141, Sept. 10, 1897, pp. 382-398.

An address delivered before the American Association for the Advancement of Science, at its Detroit meeting, 1897.

The methods of the spread of land species by the agency of man are described, and the most frequent methods of such spread are noted, with a general consideration of the biological principles involved.

The article was reprinted in the *Scientific American Supplement*, Nos. 1134, 1135, and 1136, Sept. 25, Oct. 2, and Oct. 9, 1897.

Author's separates published September, 1897.

— Additional observations on the parasites of *Orgyia leucostigma*.

Bull. Div. Ent., U. S. Dept. Agric., No. 9 (New series), Oct., 1897, pp. 15-17.

An account of the rearing of parasites from the host-insect mentioned, showing a greater preponderance of dipterous parasites. Comparative tables of mortality ratios are given. This account is supplementary to that which appeared in Bulletin No. 5, Technical series.

— Temperature experiments as affecting received ideas on the hibernation of injurious insects.

HOWARD, LELAND O.—Continued.

Bull. Div. Ent., U. S. Dept. Agric., No. 9
(New series), Oct., 1897, pp. 18, 19.

An account of cold storage experiments which indicate that a consistent low temperature is much more favorable for successful hibernation than alternating high and low temperatures.

— A useful American scale insect.

Bull. Div. Ent., U. S. Dept. Agric., No. 9
(New series), Oct., 1897, pp. 38-40.

A review of the commercial uses of scale insects with an account of *Cercooccus quercus*, its chemical composition, abundance, and commercial possibilities.

— Mosquitoes and fleas.

Circ. Div. Ent., U. S. Dept. Agric., No. 13
(New series), Dec. 1, 1897, pp. 1-4. Revised edition.

An account of the life histories and remedies to be used against mosquitoes and fleas.

— Report of the Entomologist for 1897.

Rep. Secy. Agric., 1897, pp. 111-116.

A review of the work of the Division of Entomology of the U. S. Department of Agriculture for the fiscal year ending June 30, 1897. Author's extras, Dec. 20, 1897.

— The Mexican Cotton-boll Weevil in 1897.

Circ. Div. Ent., U. S. Dept. Agric., No. 27
(New series), Jan. 5, 1898, 7 pp.

A review of the spread of *Anthonomus grandis* in Texas during 1897, and of the investigation of the subject in the field.

— The Box-elder Plant Bug, *Leptocoris trivittatus* Say.

Circ. Div. Ent., U. S. Dept. Agric., No. 28
(New series), Jan. 12, 1898, 3 pp., 1 fig.

An account of the life history and remedies to be used against *Leptocoris trivittatus*, together with some account of its geographical distribution.

— The Gipsy Moth in America: a summary account of the introduction and spread of *Porthetria dispar* in Massachusetts, and of the effort made by the State to repress and exterminate it.

Bull. Div. Ent., U. S. Dept. Agric., No. 11
(New series), Jan. 11, 1898, 39 pp., 8 figs.

— A new parasite of the Harlequin Cabbage Bug.

Canadian Entomologist, xxx, No. 1 (Jan., 1898), pp. 17, 18.

Describes *Encyrtus johnsoni*, new species, with remarks on *Trissolcus murgantiae* Ashm.

— On some parasites of the Coccidæ, with descriptions of two new genera of Aphelininæ.

HOWARD, LELAND O.—Continued.

Proc. Ent. Soc. Wash., iv, No. 2, pp. 133-139, 3 figs.

Remarks on the geographical distribution of some common oocoid parasites, with descriptions of the male of *Arrhenophagus*; *Archenomus*, new genus; *bicolor*, new species; *Azotus*, new genus; *marshali*, new species.

Author's extras published Feb. 11, 1898.

— (Review of) Les Cécidomyies des céréales et leurs parasites, by Dr. Paul Marchal.

Science (New series), vii, Feb. 18, 1898, pp. 246-248.

— The San Jose Scale in 1896-97.

Bull. Div. Ent., U. S. Dept. Agric., No. 12
(New series), Mar. 25, 1898, pp. 1-31, fig. 1.

A general account of *Aspidiotus perniciosus* supplementary to that published in Bulletin No. 3 (New series), Division of Entomology.

— The Fig-eater or Green June Beetle.

Bull. Div. Ent., U. S. Dept. Agric., No. 10
(New series), Mar. 26, 1898, pp. 20-26, fig. 1.

An account of the life history of *Allothina nitida* L., with some consideration of the remedies to be used against it.

— Further notes on the House Fly.

Bull. Div. Ent., U. S. Dept. Agric., No. 10
(New series), Mar. 26, 1898, pp. 63-65.

An account of experiments with air-slaked lime, land-plaster, gas-lime, chloride of lime, and kerosene against *Musca domestica*, with some observations on the development of this insect.

— General notes.

Bull. Div. Ent., U. S. Dept. Agric., No. 10
(New series), Mar. 26, 1898, pp. 87-97, 1 fig.

A peculiar injury to apples; another lead-boring insect; *Icerya purchasi* in Portugal and the Azores; injury by the Western flea-beetle; windrow remedy for blister beetles; white grubs of *Allothina nitida* invading a cellar; damage by *Lioderma uhleri*; food plants of *Dysdercus nufarellus*; collecting locust eggs in Morocco; poisoning grasshoppers in Natal; collecting grasshoppers in New Hampshire.

— Notes from correspondents.

Bull. Div. Ent., U. S. Dept. Agric., No. 10
(New series), Mar. 26, 1898, pp. 97-99.

— Recent laws against injurious insects in North America

Bull. Div. Ent., U. S. Dept. Agric., No. 13
(New series), Mar. 31, 1898, 68 pp.

A compilation of the recent laws relating to injurious insects in the United States and British America, together with the laws relative to foul brood.

HOWARD, LELAND O.—Continued.

- A new egg parasite of the periodical Cicada.

Canadian Entomologist, xxx, No. 4, April, 1898, pp. 102, 103.

Description of *Lathromeris cicadae*, new species.

- On the entomological results of the exploration of the British West Indian Islands by the British Association for the Advancement of Science.

38th Ann. Rep. Ent. Soc. Ontario, 1897 (April, 1898), pp. 62-64.

A brief history of the exploration in question, with a summary of the material reported upon and of the comments of the different authors on geographical distribution, together with a plea for similar work in little known parts of the United States.

- Insect life underground.

Nature and Art, Chicago, I, No. 4, May, 1898, pp. 155-159, 1 pl.

An account of the insects which live beneath the surface of the ground, with a popular consideration of the value of their work in producing soil changes.

- Work of the Division of Entomology.

Yearbook U. S. Dept. Agric., 1897 (May 31, 1898), pp. 84-89.

A popular account of the work which is carried on in the Division of Entomology, U. S. Department of Agriculture.

Author's extras of this paper were published May 17, 1898.

- Danger of importing insect pests.

Yearbook U. S. Dept. Agric., 1897 (May 31, 1898), pp. 529-552, figs. 25-43.

A general consideration of the subject, including specific mention of Europe as a source of danger; injurious insects from the tropics; insects from the Pacific regions; insects from other parts of the world; methods of importation of insects; the Morelos orange fruit worm; injurious Australian insects; the Bermuda peach maggot; a few European destructive insects; some dangerous Japanese insects; national quarantine and inspection.

Author's extras of this paper were issued June 6, 1898.

KENDALL, WILLIAM C.

(See under B. W. EVERMANN.)

KNOWLTON, FRANK HALL. Sensitive-ness of the Sundew.

Plant World, I, Oct., 1897, pp. 7, 8.

- Note on *Artiocarpus*.

Plant World, I, Oct., 1897, p. 12.

KNOWLTON, FRANK HALL—Continued.

- A remarkable lily.

Plant World, I, Oct., 1897, p. 16.

- Some early American botanists.—Amos Eaton.

Plant World, I, Nov., 1897, pp. 17, 18. Portrait.

- *Gelesmium* and its habits.

Merck's Report, vi, Dec., 1897, p. 723.

- National forests and their preservation.

Plant World, I, Dec., 1897, pp. 40, 41.

- The standing fossil forests of the Yellowstone National Park.

Plant World, I, Jan., 1898, pp. 53-55, with plate.

- The Elephant Tree.

Plant World, I, May, 1898, pp. 113-116, pl. v.

- [Note on taking up of copper by pine trees.]

Plant World, I, June, 1898, p. 142.

LINELL, MARTIN L. New species of Coleoptera of the family Chrysomelidae, with a short review of the tribe Chlamydini.

Proc. U. S. Nat. Mus., xx, No. 1180, Jan. 5, 1898, pp. 473-485.

LINTON, EDWIN. Notes on the larval cestode parasites of fishes.

Proc. U. S. Nat. Mus., xix, No. 1123, Oct. 1, 1897, pp. 787-824, pls. LXI-LXVIII.

- Notes on cestode parasites of fishes.

Proc. U. S. Nat. Mus., xx, No. 1125, Dec. 24, 1897, pp. 423-456, pls. XXVII-XXXIV.

- Notes on trematode parasites of fishes.

Proc. U. S. Nat. Mus., xx, No. 1133, Jan. 20, 1898, pp. 507-548, pls. XL-XLIV.

LUCAS, FREDERIC A. The tongues of birds.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1895 (1897), pp. 1001-1019, pls. 1, 2, figs. 1-13.

A somewhat popular account of the structure of the tongues of birds and their modifications according to the food of the various groups.

- A right royal robe.

St. Nicholas, Sept., 1897, pp. 814, 915, 1 fig. A description of the Hawaiian feather cloak in the U. S. National Museum.

LUCAS, FREDERIC A.—Continued.

— The Fur-seal investigation of 1897.

Science (New series), vi. No. 145, Oct. 15, 1897, pp. 568, 569.

A résumé of the work of the Fur-seal Commission of 1897.

— Report of death of pups from *Uncinaria*.

Observations on the Fur-seals of the Pribilof Islands. Second Preliminary Report, by David Starr Jordan, 1897, (Appendix 1), pp. 32-34.

Shows that large numbers of young Fur-seals die from the attacks of a parasitic worm of the genus *Uncinaria*; describes the symptoms and duration of the plague, and shows that deaths from this cause are not to be confused with deaths from starvation.

MCGREGOR, R. C. Note on *Speotyto cunicularia obscura* Stephens.

Auk, xv, No. 2, April, 1898, p. 187.

Measurements and comparisons made by the writer tend to show that *Speotyto cunicularia obscura* Stephens is merely a small individual of the ordinary Burrowing Owl of the west.

MASON, OTIS TUFTON. Geographical distribution of the musical bow.

Am. Anthropologist, x, Nov., 1897, No. 11, pp. 377-380.

This paper describes the musical bow found among African and American tribes. The author expresses his belief that stringed instruments were not known to any of the aborigines of the Western Hemisphere before Columbus.

MEARNS, EDGAR A. Descriptions of six new mammals from North America.

Proc. U. S. Nat. Mus., xix, No. 1121, July 17, 1897, pp. 719-724.

— Preliminary diagnoses of new mammals of the genera *Lynx*, *Urocyon*, *Spilogale*, and *Mephitis*, from the Mexican boundary line.

Proc. U. S. Nat. Mus., xx, No. 1126, Dec. 24, 1897, pp. 457-461.

— Preliminary diagnoses of new mammals of the genera *Mephitis*, *Dorcelaphus*, and *Dicotyles*, from the Mexican border of the United States.

Proc. U. S. Nat. Mus., xx, No. 1129, Dec. 24, 1897, pp. 467-471.

— Preliminary diagnoses of new mammals of the genera *Sciurus*, *Castor*, *Neotoma*, and *Sigmodon*, from the Mexican border of the United States.

Proc. U. S. Nat. Mus., xx, No. 1132, Jan. 17, 1898, pp. 501-505.

MEEK, SETH EUGENE.

(See under B. W. EVERMANN.)

MERRIAM, C. HART. *Syrnium occidentale caurinum*, a new owl from the Puget Sound region.

Auk, xv, No. 1, Jan., 1898, pp. 39, 40.

A new owl from Mount Vernon, Wash., is here described.

MERRILL, GEORGE PERKINS. Notes on the geology and natural history of the peninsula of Lower California.

Rep. Smithsonian Inst., (U. S. Nat. Mus.), 1895 (1897), pp. 969-994, pls. 1-10.

MILLER, GERRIT S., jr. Revision of the North American bats of the family *Vespertilionidae*.

North Am. Fauna, No. 13, Oct. 16, 1897, pp. 1-140, pls. I-III, figs. 1-40.

A detailed synopsis of the *Vespertilionidae* known to occur north of Panama and in the West Indies. Special attention is given to nomenclature, keys, and descriptions. Nine new forms are recognized among the 46 forms known to inhabit the region.

— Description of a new rodent of the genus *Idiurus*.

Proc. Biol. Soc. Wash., xii, Mar. 24, 1898, pp. 73-76, figs. 15-19.

Idiurus macrotis, n. sp., is described.

— A new rabbit from Margarita Island, Venezuela.

Proc. Biol. Soc. Wash., xii, Apr. 30, 1898, pp. 97, 98.

Lepus margaritæ, n. sp., is described.

— A new chipmunk from northeastern China.

Proc. Acad. Nat. Sci. Phila., Aug. 1, 1898, pp. 348-350.

Eutamias senescens, sp. nov., is described.

— List of bats collected by Dr. W. L. Abbott in Siam.

Proc. Acad. Nat. Sci. Phila., July 25, 1898, pp. 316-325.

Cynopteris angulatus, n. sp., *Keriroula minuta*, n. sp., and *Emballonura peninsularis*, n. sp., are described.

MOORE, CHARLES. The Ontonagon copper boulder in the U. S. National Museum.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1895 (1897), pp. 1021-1030, pls. 1, 2.

NELSON, E. W. Descriptions of new birds from the Tres Marias Islands, western Mexico.

Proc. Biol. Soc. Wash., xii, Jan. 27, 1898, pp. 5-11.

Eleven species and subspecies from the Tres

NELSON, E. W.—Continued.

Marías Islands are described as new, viz: *Columba flavirostris madrensis*, *Leptotila capitalis*, *Buteo borealis fumosus*, *Polyborus cheriway pallidus*, *Trogon ambiguus goldmani*, *Nyctidromus albicollis insularis*, *Myiopagis placens minimus*, *Cardinalis cardinalis mariae*, *Vireo hypochryseus sordidus*, *Melanotis caerulescens longirostris*, and *Thryothorus lawrencii magdalena*.

— Descriptions of new birds from Mexico, with a revision of the genus *Dactylortyx*.

Proc. Biol. Soc. Wash., XII, Mar. 24, 1898, pp. 57-68.

Heleodytes brunneicapillus obscurus, *Vireo nanus*, *Progne sinaloa*, *Phainothraupis rubicoides roesus*, *Amphispiza bilineata grisea*, *Guiraca chiapensis*, *Grallaria ochraceiventris*, *Amazilia cinnamomea satulata*, *Dactylortyx chiapensis*, and *D. devius* are described as new. Four forms of *Dactylortyx* are recognized, *D. thoracicus*, *D. thoracicus lineolatus*, and the two new species above described.

— Notes on the wild fowl and game animals of Alaska.

Nat. Geograph. Magazine, IX, No. 4, April, 1898, pp. 121-132, 6 figs.

A popular account of some of the game birds and mammals of Alaska.

— Notes on certain species of Mexican birds.

Auk, XV, No. 2, April, 1898, pp. 155-161.

These notes treat of the geographical distribution, nomenclature, and relationships of various species of Mexican birds.

OBERHOLSER, HARRY C. Description of a new *Empidonax*, with notes on *Empidonax difficilis*.

Auk, XIV, No. 3, July, 1897, pp. 300-303.

Empidonax insulicola is described from Santa Rosa Island, Cal., and its relationship to *E. cineritius* is explained.

— Critical notes on the genus *Auriparus*.

Auk, XIV, No. 4, Oct., 1897, pp. 390-394.

Auriparus flaviceps lanprocephalus is described in this paper as new.

— Description of a new *Amazilia*.

Auk, XV, No. 1, Jan., 1898, pp. 32-36.

Amazilia cerviniventris chalconota, from Brownsville, Tex., is described as new, and its relationships pointed out.

— The birds of Liberia.

Liberia, Bull. No. 12, American Colonization Society, Washington, D. C., Feb., 1898, pp. 16-25.

A popular sketch of the birds of Liberia.

PALMER, WILLIAM. The Sitkan Kinglet.

Auk, XIV, No. 4, Oct., 1897, pp. 399-401.

Regulus calendula grinnelli is here described as new.

— An addition to North American Petrels.

Auk, XIV, No. 3, July, 1897, pp. 297-299.

Oceanodroma cryptoleucura is recorded from North America, based on two specimens found in Washington City after the great storm of Aug. 26, 27, 1893. This species and *O. leucorhoa* are described, and the differences between them pointed out.

PILSBRY, HENRY A. Manual of Conchology. Parts 66 and 67.—Dentaliidae.

Man. Conch. Struct. and Syst., Pt. 66, pp. 81-144, pls. 10-26; Pt. 67, pp. 145-224, pls. 27-37.

The entire collection of Dentaliidae in the National Museum was studied by Professor Pilsbry, and the present monograph is in part based on this material. A number of the types of new species, etc., are contained in the Museum.

POLLARD, CHARLES LOUIS. Two new violets.

Bull. Torrey Botan. Club, XXIV, Aug. 29, 1897, p. 404.

This paper describes *V. flavovirens*, from Idaho, and *V. porteriana*, from Pennsylvania, with a figure of the last named. The types of both species are in the U. S. National Herbarium.

— The genus *Oxytría* of Rafinesque.

Bull. Torrey Botan. Club, XXIV, Aug. 29, 1897, p. 405.

This paper revises the nomenclature of the genus *Oxytría*, which replaces *Schoenolirion* of Durand. The study is based on Museum material.

— The families of flowering plants.

Plant World, I, Oct., 1897, to Mar., 1898, pp. 5, 19, 37, 56, 71, 88.

A series of popular descriptive articles on the characters distinguishing the flowering plant families. The series thus far includes only the monocotyledons.

— Note on *Dioscorea batatas* in cultivation.

Plant World, I, Dec., 1897, p. 48.

— Note on the Egg Plant as a perennial in the far south.

Plant World, I, June, 1898, p. 143.

— Note on a hermaphrodite willow (*Salix bebbiana* Sargent).

Plant World, I, June, 1898, p. 144.

RATHBUN, MARY J. List of the decapod crustacea of Jamaica.

Ann. Inst. Jamaica, I, No. 1, Sept., 1897, pp. 1-46.

The crustacea in the collection of Mr. P. W. Jarvis, Kingston, and in the museum of the Institute of Jamaica, form the basis of this list, which includes also the results of explorations by the Johns Hopkins University and by the U. S. Fish Commission.

— Descriptions of three new species of fresh-water crabs of the genus *Potamon*.

Proc. Biol. Soc. Wash., XII, Jan. 27, 1898, pp. 27-30, pls. 1, II.

One species is a typical *Potamon* from the Malayan Peninsula; two are members of the subgenus *Geothelphusa* from the Loo Choo Islands and from West Africa.

— The brachyura of the biological expedition to the Florida Keys and the Bahamas in 1898.

Bull. Laboratories Nat. Hist. State Univ. Iowa, IV, June, 1898, pp. 250-294, pls. I-IX.

Descriptions of eleven new species of crabs in the National Museum.

RICHARDSON, HARRIET. Description of a new crustacean of the genus *Spharoma*, from a warm spring in New Mexico.

Proc. U. S. Nat. Mus., XX, No. 1128, Dec. 24, 1897, pp. 465, 466.

This crustacean, *Spharoma thermophilum*, was taken from a warm spring near Socorro, New Mexico, by Mr. T. D. A. Cockerell. It is contrasted with *S. dugesi* Dollfus, a Mexican species, and the only other *Spharoma* inhabiting fresh water.

An advance edition of this paper was published Feb. 6, 1897.

— Description of a new parasitic isopod of the genus *Æga* from the southern coast of the United States.

Proc. Biol. Soc. Wash., XII, Mar. 24, 1898, pp. 39, 40, figs. 1, 2.

The specimens were obtained by the U. S. Fish Commission steamer *Albatross*—one off Little Bahama Bank, and the other in the Gulf of Mexico.

— Description of four new species of *Rocinela*, with a synopsis of the genus.

Proc. Am. Philosoph. Soc., XXXVII, No. 157, June, 1898, pp. 8-17, figs. 1-10.

Nineteen species are included in the genus *Rocinela*. A chronological list and a synopsis of the species are given. The new species are all from the dredgings of the *Albatross*.

RICHMOND, CHARLES W. (Review of) Notes on birds observed in Yucatan, by Frank M. Chapman.

Auk, XIV, No. 3, July, 1897, p. 333.

— The Western Field Sparrow, *Spizella pusilla arenacea* Chadbourne.

Auk, XIV, No. 4, Oct., 1897, pp. 345-347, pl. III.

The paper presents an account of this subspecies.

— The Cayenne Swift, *Panyptila cayensis* (Gmelin).

Auk, XV, No. 1, Jan., 1898, pp. 7-10, pl. I.

In this paper is presented an account of the distribution, habits, and nesting of this species.

RIDGWAY, ROBERT. Description of the nest and eggs of Bachman's Warbler.

Auk, XIV, No. 3, July, 1897, pp. 309, 310.

The nest and eggs found by Mr. Otto Widmann are here described.

— An earlier name for *Ammodramus leconteii*.

Auk, XIV, No. 3, 1897, p. 320.

Fringilla caudacuta of Latham is found to apply to Leconte's Sparrow, the present name of which does not change, since *Fringilla caudacuta* of Latham is antedated by *Oriolus caudacutus* of Gmelin.

— On the status of *Lanius robustus* Baird as a North American bird.

Auk, XIV, No. 3, July, 1897, p. 323.

This supposed species is considered to be an "aberrant" specimen of *Lanius algeriensis*, and consequently not a North American bird.

— (Review of) Bird Life, by Frank M. Chapman.

Auk, XIV, No. 3, July, 1897, pp. 336-338.

— Descriptions of supposed new genera, species, and subspecies of American birds. I—Fringillidae.

Auk, XV, No. 3, July, 1898, pp. 223-230.

Fourteen genera and eight species and subspecies are described as new, viz: *Melanospiza*, *Brachyospiza*, *Myospiza*, *Plagiospiza*, *Rhynchospiza*, *Psaltriparus*, *Lynurus*, *Seriopsis*, *Heterospingus*, *Mitrospingus*, *Rhodothraupis*, *Hemithraupis*, *Stelgidostomus*, *Aimophila ruficeps sororia*, *Aimophila sartorii*, *Atlapetes pileatus dilutus*, *Arremonops venezuelensis*, *Arremonops richmondi*, *Cyanocampus comeroti cyanacens*, *Amphispiza bilineata deserticola*, *Amphispiza belli clementae*.

Author's extras issued May 13, 1897.

ROSE, JOSEPH NELSON. Studies of Mexican and Central American plants.

Contrib. U. S. Nat. Herbarium, v. No. 3, Aug. 27, 1897, pp. 109-144, pls. 1-1v.

This paper is a technical study of some Mexican and Central American plants, including the revision of some difficult genera, and the description of more than 50 species new to science.

— *Agave washingtonensis* and other Agaves.

Ninth Ann. Rep. Missouri Bot. Garden, Apr. 20, 1898, pp. 121-126, pls. 29-31.

A short account of four Agaves which flowered in Washington during the year 1897, one of which had not been previously described.

— *Loeselia cordifolia*, n. sp.

Hooker's Icon. Plant., xxvi, Pt. 3, 1898, pl. 2551.

A new species from Mexico which Mr. Rose describes in connection with Mr. W. Botting Hemsley, of Kew, England.

SALVIN, OSBERT, and GODMAN, F. D. An account of the owls of the Central American region.

Biologia Centrali-Americana, Aves, III, Nov., 1897, pp. 1-40, pls. LXI, LXII.

This account embraces 34 species, of which *Syrnium fulvescens* and *Scops trichopsis* are figured.

SCHUCHERT, CHARLES. A synopsis of American fossil Brachiopoda, including bibliography and synonymy.

Bull. U. S. Geol. Surv., No. 87, 1897, pp. 1-464.

The contents of this volume are: Geological development and geographical distribution of American fossil Brachiopoda; brachiopod terminology, applied to fossil forms; biological development of the Brachiopoda; morphology of the brachia, by Charles E. Beecher; classification of the Brachiopoda; index and bibliography of American fossil Brachiopoda.

— (See also under DAVID WHITE.)

SCOFIELD, NORMAN BISHOP.

(See under CHARLES HENRY GILBERT.)

SCUDDER, SAMUEL HUBBARD. Revision of the Orthopteran group Melanopli (Acridiidae), with special reference to North American forms.

Proc. U. S. Nat. Mus., xx, No. 1124, Dec. 28, 1897, pp. 1-421, pls. 1-xxvi.

SHUFELDT, R. W. Taxidermical methods in the Leyden Museum.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1895 (1897), pp. 1031-1038, pls. 1-6.

SMITH, HUGH M. The fishes found in the vicinity of Woods Hole.

Bull. U. S. Fish Comm., 1897 (Jan. 6, 1898), pp. 85-111.

The fishes listed in this paper represent 88 families, 160 genera, and 209 species, and were collected by the U. S. Fish Commission.

STANTON, TIMOTHY WILLIAM. A comparative study of the Lower Cretaceous formations and faunas of the United States.

Journ. Geol., v, Sept.-Oct., 1897, pp. 579-624.

A portion of the paleontological material treated of in this general discussion is in the collection of the National Museum.

— Supplement to the annotated catalogue of the published writings of Charles Abiathar White, 1886-1897.

Proc. U. S. Nat. Mus., xx, No. 1135, Feb. 12, 1898, pp. 627-642.

STEARNS, ROBERT E. C. Quarter-decks and Jingles.

Nautilus, xi, No. 4, Aug., 1897, pp. 38-40.

"Quarter-decks" and "Jingles" are the names locally applied to the shells of certain marine mollusks properly known as *Orepidula fornicata* Linné, and *Anomia simplex* Orbigny. Large quantities (thousands of bushels) of these shells are taken by dredging in the neighborhood of Greenport, N. Y., and sold to the oystermen of that general region to be used as "catchment objects" or material for forming spawning beds for *Ostrea virginica*.

— *Modiola plicatula* Lamarck, an extinct locality.

Nautilus, xi, No. 2, Jan., 1898, pp. 102, 103.

That portion of the city of Boston west of the Public Garden and extending to Roxbury, known as the Back-bay section, was fifty years ago simply a salt marsh, with occasional patches of mud flats. In the greater part of this area the well-known mussel, *Modiola plicatula* Lamarck, was abundant, and millions must have been destroyed when the marshes were filled up.

STEJNEGER, LEONHARD. Stjernen.

Bergens Tidende, Jan. 21, 1898, p. 2.

A popular account of a Christmas custom on Bering Island.

— Ross's Gull, *Rhodostethia rosea*, on Bering Island.

Auk, xv, No. 2, Apr., 1898, p. 183.

This is the first record of the occurrence of this bird on Bering Island, and the first authentic record for Kamchatka.

STEJNEGER, LEONHARD—Continued.

— The rookeries of the Commander Islands.

Observations on the Fur-seals of the Pribilof Islands. Second Preliminary Report, by David Starr Jordan, 1897 (Appendix II), pp. 35-38.

Condensed from the full report.

— Report on the rookeries of the Commander Islands, season of 1897.

Doc. No. 1997, Treas. Dept. (Office of Secretary, Special Agents Division), pp. 1-17.

STILES, CHARLES WARDELL. The flukes and tapeworms of cattle, sheep, and swine, with special reference to the inspection of meats.

Bull. Bureau Animal Industry, U. S. Dept. Agric., No. 19, 1898, pp. 11-136, figs. 1-124.

The inspection of meats for animal parasites.

STILES, CHARLES WARDELL, and HASSELL, ALBERT. Notes on parasites 48.—An inventory of the genera and subgenera of the tæmatode family Fasciolidae.

Arch. d. Parasitologie, 1, pp. 81-99.

TASSIN, WIRT. The mineralogical collections in the U. S. National Museum.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1895 (1897), pp. 995-1000, pl. 1.

TOWNSEND, CHARLES H.

(See under THEODORE GILL.)

VERRILL, ADDISON E. A study of the family Pectinidae, with a revision of the genera and subgenera.

Trans. Conn. Acad. Sci., x, July, 1897, pp. 48-95, pls. xvi-xxi.

This paper comprises some of the preliminary studies upon which a later paper by Verrill and Bush in the Proceedings of the United States National Museum (Vol. xx, No. 1139) was based.

VERRILL, ADDISON E., and BUSH, KATHARINE J. Revision of the deep-water mollusks of the Atlantic Coast of North America, with descriptions of new genera and species. Part 1.—Bivalvia.

Proc. U. S. Nat. Mus., xx, No. 1139, June 16, 1898, pp. 775-901, pls. LXXI-XCVII.

The material upon which this paper is based forms a part of the collection of mollusks in the United States National Museum.

WALCOTT, CHARLES D. Cambrian Brachiopoda: Genera *Iphidea* and *Yorkia*, with descriptions of new species of each and of the genus *Acrothele*.

Proc. U. S. Nat. Mus., xix, No. 1120, Aug. 17, 1897, pp. 707-718, pls. LIX, LX.

WHITE, DAVID. *Omphalophlois*, a new Lepidodendroid type.

Bull. Geol. Soc. Am., ix, May, 1898, pp. 329-342, pls. 20-23.

WHITE, DAVID, and SCHUCHERT, CHARLES. Cretaceous series of the west coast of Greenland.

Bull. Geol. Soc. Am., ix, May, 1898, pp. 343-368, pls. 24-26.

WIDMANN, O. The summer home of Bachman's Warbler no longer unknown. A common breeder in the St. Francis River region of southeastern Missouri and northeastern Arkansas.

Auk, xiv, No. 3, July, 1897, pp. 305-309.

An account of the breeding habits, nests, and eggs of Bachman's Warbler, until now unknown.

— Investigation in the sand-pits of the Lalor Field, near Trenton, N. J.

Proc. Am. Assoc. Adv. Sci., XLVI, 1897, pp. 381-383.

WILSON, THOMAS. The antiquity of the red race in America.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1895 (1897), pp. 1039-1045.

This article appeared in substantially the same form in *The Archaeologist*, also in *Popular Science News*, xxxi, No. 2, Feb., 1897, pp. 35, 36, and No. 3, Mar., 1897, p. 60.

— Arrow-points and spear-heads. Class A, beveled edges.

Am. Archaeologist, ii, part 6, June, 1898, pp. 141, 142.

A description of experiments made by the author regarding the rotary motion of beveled-edged specimens.

— Description and history of lace.

[*Special*] *Rep. No. 9, U. S. Dept. Agric. (Fiber Investigations)*, Appendix C, pp. 359-361.

This article forms a part of "A descriptive catalogue of the useful fiber plants of the world, including the structural and economic classification of fibers," by Charles Richards Dodge.

WILSON, THOMAS, and GORE, J. HOWARD. Report of the Commissioners of

WILSON, THOMAS, and GORE, J. HOWARD—Continued.
the United States to the International
Exposition held at Brussels in 1897.

Senate Doc., No. 152, 55th Cong., 2d sess.,
80, pp. 1-43, pls. 1-9.

See pages 35-43 for description of Science
Section.

WORCESTER, DEAN C., and BOURNS,
FRANK S. Contributions to Philip-
pine ornithology.

Proc. U. S. Nat. Mus., xx, No. 1134, Feb.
17, 1897, pp. 549-625, pls. LV-LXI.

Part I, "A list of the birds known to in-
habit the Philippine and Palawan islands,
showing their distribution within the limits
of the two groups," by Dean C. Worcester,
A. B., and Frank S. Bourns, M. D. Gives a
tabulated statement of 595 species known to
inhabit the Philippine and Palawan groups of
islands, of which 69 species are restricted to
the last-named group. The distribution of
the species in the various islands is indi-
cated, and species peculiar to the Philippines
are designated by the use of italics.

Part II, entitled "Notes on the distribution
of Philippine birds," by Dean C. Worcester,
deals with the distribution of species in the
Philippines; the zoological position of the
Palawan group, and the relationships of
species in the different islands; a discussion
of Steeres's law of distribution; factors in the
origin and distribution of the genera and
species of resident Philippine land birds
(illustrated by six plates), and the possibili-
ties of future ornithological work in the
Philippines.

NAT MUS 98—10

WRIGHT, BERLIN H. New unios.

Nautilus, xi, Aug., 1897, pp. 40-41; Sept.,
1897, pp. 55, 56.

In the first article *Unio pinet*, n. sp., from
an unnamed lake in the Withlacoochee River
region of Hernando County, Fla., is described.

In the second article *Unio buxtoni* from
small lakes in Marion County, Fla., is de-
scribed, and *Unio suttoni* from near Lake
Candler, Marion County, Fla.

— A new plicate unio.

Nautilus, xi, Dec., 1897, pp. 91, 92.

Unio walkeri, from Suwanee River, Madi-
son County, Fla., is described.

— A new undulate unio from Alabama.

Nautilus, xi, Jan., 1898, pp. 101, 102.

Unio triumphans, from the Coosa River,
St. Clair County, Ala., is described.

— Description of a new unio.

Nautilus, xi, Feb., 1898, pp. 111, 112.

Unio reclusus, from the Ocklocknee River,
Leon County, Fla., is described.

— New varieties of Unionidæ.

Nautilus, xi, Mar., 1898, pp. 123, 124.

A description of a variety, *armathwaitensis*,
of *Unio gibbosus*, from a branch of the South
Fork of the Cumberland River at Arma-
thwaite, Fentress County, Tenn.

— New Unionidæ.

Nautilus, xii, May, 1898, pp. 5, 6.

Unio strodeanus and a variety, *strigillatus*,
of *U. cylindricus* are described.

The types of Mr. Berlin H. Wright's new
unios were donated to the U. S. National
Museum.

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APPENDIX V.

PAPERS PUBLISHED IN SEPARATE FORM DURING THE YEAR ENDING JUNE 30, 1898.

FROM THE REPORT FOR 1895.

- Report upon the condition and progress of the U. S. National Museum during the year ending June 30, 1895. By G. Brown Goode. pp. 1-308.
- The social organization and the secret societies of the Kwakiutl Indians. By Franz Boaz. pp. 311-738. pls. 1-51, figs. 1-215.
- The graphic art of the Eskimos. (Based upon the collections in the National Museum.) By Walter James Hoffman. pp. 739-968, pls. 1-82, figs. 1-154.
- Notes on the geology and natural history of the Peninsula of Lower California. By George P. Merrill. pp. 969-994, pls. 1-10.
- The mineralogical collections in the U. S. National Museum. By Wirt Tassin. pp. 995-1000, pl. 1.
- The tongues of birds. By Frederic A. Lucas. pp. 1001-1020, pls. 1, 2, figs. 1-13.
- The Ontonagon copper boulder in the U. S. National Museum. By Charles Moore. pp. 1021-1030, pls. 1, 2.
- Taxidermical methods in the Leyden Museum, Holland. By R. W. Shufeldt. pp. 1031-1038, pls. 1-6.
- The antiquity of the red race in America. By Thomas Wilson. pp. 1039-1045.

FROM VOLUME 19, PROCEEDINGS OF THE U. S. NATIONAL MUSEUM.

- No. 1120. Cambrian Brachiopoda: Genera *Iphidea* and *Yorkia*, with descriptions of new species of each, and of the genus *Acrotheld*. By Charles D. Walcott. pp. 707-718, pls. LIX, LX.
- No. 1121. Descriptions of six new mammals from North America. By Dr. Edgar A. Mearns, U. S. A. pp. 719-724.
- No. 1122. The food plants of scale insects (Coccidæ). By T. D. A. Cockerell. pp. 725-785.
- No. 1123. Notes on the larval cestode parasites of fishes. By Edwin Linton. pp. 787-824, pls. LXI-LXVIII.

FROM VOLUME 20, PROCEEDINGS OF THE U. S. NATIONAL MUSEUM.

- No. 1124. Revision of the Orthopteran group Melanopl (Acridiidae), with special reference to North American forms. By Samuel Hubbard Scudder. pp. 1-421, pls. I-XXVI.
- No. 1125. Notes on cestode parasites of fishes. By Edwin Linton. pp. 423-456, pls. XXVII-XXXIV.
- No. 1126. Preliminary diagnoses of new mammals of the genera *Lynx*, *Urocyon*, *Spilogale* and *Mephitis*, from the Mexican boundary line. By Dr. Edgar A. Mearns, U. S. A. pp. 457-461.
- No. 1127. Description of a new blenny-like fish of the genus *Opisthocentrus*, collected in Vulcano Bay, Port Mororan, Japan, by Nicolai A. Grebnitski. By Tarleton H. Bean and Barton A. Bean. pp. 463, 464, pl. xxxv.

- No. 1128. Description of a new crustacean of the genus *Spharoma* from a warm spring in New Mexico. By Harriet Richardson. pp. 465, 466.
- No. 1129. Preliminary diagnoses of new mammals of the genera *Mephitis*, *Dorselaphus*, and *Dicotyles*, from the Mexican border of the United States. By Dr. Egdar A. Mearns, U. S. A. pp. 467-471.
- No. 1130. New species of Coleoptera of the family Chrysomelidae, with a short review of the tribe Chlamydini. By Martin L. Linell. pp. 473-485.
- No. 1131. Notes on a collection of fishes from the Colorado Basin in Arizona. By Charles Henry Gilbert and Norman Bishop Scofield. pp. 487-499, pls. XXXVI-XXXIX.
- No. 1132. Preliminary diagnoses of new mammals of the genera *Sciurus*, *Castor*, *Neotoma*, and *Sigmodon*, from the Mexican border of the United States. pp. 501-506.
- No. 1133. Notes on trematode parasites of fishes. By Edwin Linton. pp. 507-548, pls. XL-LIV.
- No. 1134. Contributions to Philippine ornithology. By Dean C. Worcester and Frank S. Bourne. pp. 549-625, pls. LV-LXI.
- No. 1135. Supplement to the Annotated Catalogue of the Published Writings of Charles Abiathar White, 1886-1897. By Timothy W. Stanton. pp. 627-642.
- No. 1136. Observations on the Astacidae in the United States National Museum and in the Museum of Comparative Zoology, with descriptions of new species. By Walter Faxon. pp. 643-694, pls. LXII-LXX.
- No. 1137. A revision of tropical African Diplopoda of the family Strongylosomatidae. By O. F. Cook. pp. 695-708.
- No. 1138. American Leaf-Hoppers of the subfamily Typhlocybinae. By Clarence P. Gillette. pp. 709-773, figs. 1-149.
- No. 1139. Revision of the deep-water mollusca of the Atlantic coast of North America, with descriptions of new genera and species. Part I.—Bivalvia. By Addison E. Verrill and Katharine J. Bush. pp. 775-801, pls. LXXI-XCVII.

BULLETIN 39.

- Part L. Directions for collecting and preserving scale insects (Coccidae). By T. D. A. Cockerell. pp. [1]-[9].

PART II.

6

THE CROCODILIANS, LIZARDS, AND SNAKES OF NORTH AMERICA.

BY

EDWARD DRINKER COPE, A. M., PH. D.,

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and Member of the U. S. National Academy of Sciences.*

THE CROCODILIANS, LIZARDS, AND SNAKES OF NORTH AMERICA.

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*Professor of Zoology and Comparative Anatomy in the University of Pennsylvania, and
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PREFACE.

The scope of the present work is to give an account of the physical characteristics of the reptiles of the orders of Loricata and Squamata, which inhabit the Nearctic zoological realm, so far as they are known to the writer. That the work is far from complete I am well aware, but that it is much in advance of other works in this respect may be well admitted, as no general work of the kind has appeared since that of Holbrook, half a century ago. With my book on the Batrachia, published in 1889, and Dr. Baur's on the Testudinata (in preparation), the access to North American herpetology becomes equal to that which the science of ornithology has long enjoyed.

The principles of classification which have been followed are those which the nature of the case requires, so far as the author has been able to discover them. One general statement may be made as an abstract proposition, and that is that the taxonomy of organic beings is a register of structural or anatomical characters from the most comprehensive to the smallest divisions. This is generally recognized in the case of the former, but there are many naturalists who fail to recognize it in the case of the more restricted divisions, and especially as applying to genera. An indefinite idea of the "naturalness" of the collocation of species necessary to constitute genera still lingers in their minds. By this idea of a "natural" association of species, they mean a group which coincides in possessing a certain community of species characters, as color, and color pattern, size, nature of surfaces, geographical range, etc., all of which, while of importance in their place, are quite irrelevant to the question of generic divisions. I long since pointed out that generic characters may, and in fact generally do, arise in the process of evolution quite independently of the specific, so that certain species of different genera resemble each other in the so-called "natural," that is, specific characters, more than they do other species of their own genus. The same phenomenon is well known among higher

groups, where I have called it "heterology;" that is, the genera of a family may parallel more or less the genera of another; or the families of one order those of another order. It is not, then, remarkable that sometimes one or more species of two or more genera should parallel each other. The reason why the aggregate of appearances is sometimes preferred to single structural differences as definition of the genus, is because it is supposed that the contents of a genus must possess closer "affinity" than species of separate genera. But this is not the case in many instances, and may not be so in any instance where the evolution of generic characters becomes known. Certain it is that in the embryonic life none of the specific characters appear before the generic. Hence, species may be polyphyletic as regards genera.

The essential of systematic biology is exact definition. Taxonomy is science only in so far as it is exact. If it be alleged that gradual evolution of characters must preclude the possibility of exact definition, I answer that this will only become a practical truth when all intermediate forms have been discovered. And it will never be a practical truth for the botany and zoology of any single geologic epoch or period—as, for instance, the present one—since most of the connecting forms belong to past periods and are not treated of in works in zoology, but in those in paleontology. There is therefore no excuse for the loose and inexact definitions which some taxonomists are accustomed to inflict on the world, which are both unscientific, and serve at the same time to obscure the subject and render it inaccessible to the student. It must be admitted, however, that in a few instances it occurs that transition between two important anatomical characters is discoverable in series of species of the existing period. The special nature of such a case will determine whether definitions with exceptions stated are admissible or not.

In the matter of nomenclature the author necessarily follows the rule of priority now adopted in all codes, and the definitions of priority contained in the report of the committee of the American Association for the Advancement of Science of 1876. According to these rules, a name can only have a status when accompanied with a description or diagnosis of that to which it is applied, whether species, genus, or division of higher rank. In the case of species, a recognizable figure is regarded as of equal validity with a description, but a figure possesses no discriminative character as a definition of any higher group. I must here insist on another point, which it has not been thought necessary hitherto to incorporate into any system of rules, since it is one which lies at the basis of all language. That is that names shall be properly spelled. This is necessary on account of the attempts on the part of more or less illiterate persons to construct names for the use of biologists, and on account of the fact that certain other naturalists, not so illiterate, feel bound to adopt their misspellings, and typographical errors as well, on account of the supposed exigencies of the law of

priority. Most of these persons take refuge behind the rules of the American Ornithologists Union, and if the code of that body furnishes defense for these violations of the elementary principles of language, it should be corrected. Among misspellings are to be included hybrid words and words which retain the Greek and other non-Latin spellings. It may be repeated here that the language of scientific nomenclature is Latin, and words derived from Greek and other languages are spelled according to the rules of the Latin language.

It is stated above that the geographical scope of the present book is the Nearctic realm. The southern continental boundary of this realm is, however, not yet entirely clear. It evidently includes a large part of the Mexican state of Sonora and the Mexican Plateau for a considerable distance farther south. Owing to lack of collections, it is difficult to state what the limit is in this direction, but I have included the state of Guanajuato, where Dr. Alfredo Dugès has traced many of the Northern species. On the east coast the fauna of the *Tierra Caliente* extends northward to and even a little beyond the Rio Grande. In southwestern Texas the presence of the genera of snakes, *Sibon*, *Coniophanes*, and *Drymobius*, indicates the northern limit of that fauna.

The results contained herein are derived chiefly from the collections of the United States National Museum. To these I have added information based on my own collections and observations in the field. The whole constitutes the first general work on the North American Sauria since that of Holbrook in 1845, and the only one on the Ophidia since the book of Baird and Girard, published in 1853. Professor Baird had such a work on the Sauria in contemplation during his lifetime, and he placed his manuscript in my hands about the year 1864 for completion. Of this manuscript I have made considerable use in the following pages, the greater part of the descriptions of fifty-one of the one hundred and nine known species of that suborder being from his pen.

In the description of the general characters and distribution of the genera of the families of the lizards I have frequently copied the language of Boulenger in the Catalogue of the Lizards in the British Museum, with omissions and additions. In the systematic arrangement of the genera of families of lizards, of which I have been able to examine but a limited number of species preserved in spirits, as the Geckonidæ, Agamidæ, and Gerrhosauridæ, I have also followed Boulenger.

Besides the collections of the U. S. National Museum, I have examined, in the preparation of this book, material belonging to the Academy of Natural Sciences of Philadelphia, and to the Philadelphia museums, to whose officers my thanks are especially due. I wish to acknowledge also my indebtedness to Dr. Alexander Agassiz for the opportunity of examining some Australian species; to Prof. Charles S.

Dolley for a collection from Hainan, China, and to Professor Wright, of Oberlin, Ohio, for a small but valuable collection from South Africa; to Mr. George K. Cherrie for a fine series from Costa Rica, and Drs. Ferrari-Perez, Bernad, Dugès, and Villada for Mexican species. To Messrs. J. B. Wood and George Pine I am indebted for collections from Florida; to Prof. W. T. Cummins for material from Texas, and to Dr. Joseph Corson, U. S. Army, for specimens from Mobile, Alabama. I am also especially indebted to the Zoological Society of Philadelphia and its superintendent, Mr. Arthur E. Brown, for specimens from the Gardens.

Class MONOCONDYLIA.

Subclass REPTILIA.

The subclass Reptilia is one of the two into which the members of the class Monocondylia naturally fall. It is defined as follows:

Basicranial axis ossified. Vertebral column consisting chiefly of centra. Limbs of the nonpiscine type, that is, embracing a single proximal element, two propodials, several mesopodials, metapodial, and phalangeal elements. One occipital condyle. A distinct quadrate bone, or suspensorium of the lower jaw. Mandible segmented. Carpal, tarsal, and metapodial elements not coossified with each other.

Cerebral hemispheres larger than mesencephalon, whose moieties are fully exposed above, and not laterally. Cerebellum small. Heart with three chambers. Aorta derived from two aorta roots, which consist of one or two bows on each side. Lungs cellular, functional. Gall bladder, pancreas, and fat-bodies present. Integument scaly. Mammary glands, none.

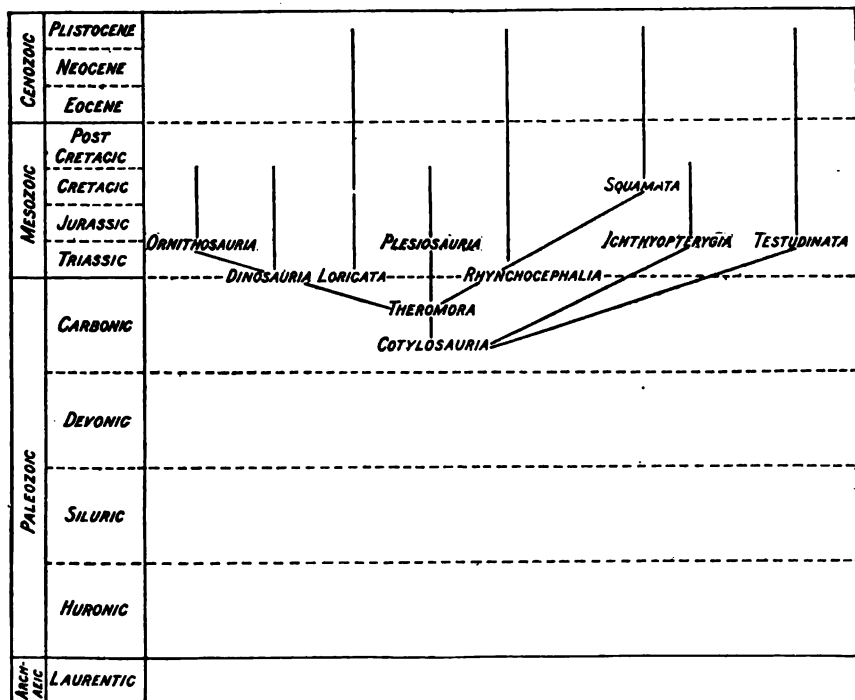
Reproduction viviparous or ovoviviparous. Fertilization internal. Copulatory organs present. Embryo with amnion and allantois; placenta, none.

The Reptilia are definitely known to appear in geological time in the Coal Measures, near the close of the Carboniferous system, although they probably appeared earlier during that system. They are represented by a number of orders, which are distinguished as follows:

- I. Quadrate bone united with adjacent elements by suture; temporal regions with roof of a few symmetrical segments. No distinct postorbital bars; vertebræ amphicœlous; ilium narrow, vertical; feet ambulatory COTYLOSAURIA.
- II. Quadrate bone united by suture to adjacent elements; one longitudinal postorbital bar (*Synaptosauria*).
 - α Scapular and pelvic arches not within thoracic and abdominal bones.
 - Paroccipital not distinct; no supramastoid; vertebræ amphicœlous; ribs with one head on centrum; the capitulum, when present, intercentral; scapula simple THEROMORA.
 - Paroccipital not distinct, a supramastoid; vertebræ amphiplatyan; ribs with one head, and that not intercentral; scapula triradiate.
PLESIOSAURIA.
 - Paroccipital and supramastoid distinct; vertebræ with two-rib articulations on centrum; phalanges, carpals, and tarsals of similar form.....ICHTHYOPTERYGIA.

- $\alpha\alpha$ Scapular and pelvic arches within thoracic and abdominal bones.
- A paroccipital; no supramastoid; a large proscapula, no precoracoid, coracoid free from sternum behind; ribs one-headed, intercentral.....TESTUDINATA.
- III. Quadrate immovably articulated; two postorbital bars (*Archosauria*). (No paroccipital bone.)
- Ribs two-headed; no interclavicle; external digits greatly elongated to support a patagium; a distinct pectineal bone ORNITHOSAURIA.
- Ribs two-headed; no interclavicle; acetabulum perforate at middle of ilium; feet ambulatory.....DINOSAURIA.
- Ribs partly two-headed; an interclavicle; acetabulum closed; feet ambulatory; no pectineal bone LORICATA.
- Ribs one-headed; an interclavicle; no pectineal bone; acetabulum closed; feet ambulatory.....RHYNCHOCEPHALLA.
- IV. Quadrate bone loosely articulated, and at proximal extremity only; one or no postorbital bar (*Streptostylica*).
- α A paroccipital bone.
- Ribs one-headed; no pectineal bone; acetabulum closed; feet not volant.....SQUAMATA.

Of these orders, five are extinct and four still exist. Their affinities and time relations may be expressed by the following table. The vertical lines represent duration in geologic time.



LORICATA.

Loricata MERREM, Tentamen Systematis Amphibiorum, 1820, p. 7.

Emydosaurs GRAY, Annals of Philosophy (2), X, 1825, p. 195.

Crocodyli WAGLER, Syst. Amphib., 1830, p. 139.

Crocodylia OWEN, Rept. Brit. Assoc. Adv. Sci., XI, 1841, p. 65.

Quadrate bone united by immovable suture with the adjacent elements; 2 postorbital longitudinal bars; cervical and dorsal ribs mostly two-headed, the capitulum articulating with the centrum, with or without parapophyses, and the tuberculum with the diapophyses. Sacrum composed of but few vertebrae. Acetabulum closed. Sternum and interclavicle present; abdominal ribs not connected with the true ribs, and composed of separate segments. Bones of proximal series of carpus and tarsus specialized. Teeth in alveoli.

Ventricle of the heart divided. Two aorta roots. Epencephalon with vermis and flocculi. Copulatory organ single. Anal orifice longitudinal.

The order of the Loricata appeared in Triassic time, and has continued up to the present day. The Triassic types differ from those of subsequent ages, so that they represent a suborder distinct from the latter. In Jurassic and Cretaceous time the order was represented by the greatest number of genera and species. Their distribution has been cosmopolitan since their appearance. The affinities of the order are with the Dinosauria, with which they are connected by the suborder Sauropoda of the latter.

The suborders differ as follows:

- External nares posterior; internal nares less posterior; pterygoids articulating with quadrate; postfrontal and postorbital bones distinct.....PARASUCHIA.
 Internal nares more posterior; external nares anterior; pterygoids not reaching quadrates; postfrontal and postorbital bones not distinct.....EUSUCHIA.

The Parasuchia include, so far as yet known, the single family of the Belodontidae. They are restricted to the Triassic system. The families of the Eusuchia are the following:

I. Vertebrae amphiplatyan.

- Posterior nares more anterior; sphenoid axis horizontal; postorbital border on plane of adjacent bones.....TELEOSAURIDÆ.
 Postorbital border internal to plane of adjacent bones.....GONIOPHOLIDIDÆ.

II. Vertebrae procœlous.

- Sphenoid vertical; postorbital border internal to adjacent plane. CROCODYLIDÆ.

The first two families do not extend beyond Mesozoic time. The Crocodylidae commence in North America in the Upper Cretaceous; in other parts of the world in the Eocene. We have to do with this family only in the present work. Its genera differ as follows:

I. A preorbital foramen.

- Dorsal vertebrae with rudimental hypapophyses; muzzle elongate, nasal bones not reaching nares *Thoracosaurus* Leidy.

II. No preorbital foramen.

 α Dorsal hypapophyses rudimental.

Muzzle elongate, nasal bones not reaching nares.

Holops Cope. $\alpha\alpha$ Dorsal hypapophyses elongate. β Mandibular teeth projecting on each side of the maxilla; muzzle elongate, nasal bones not reaching nares nor premaxillaries *Garialis* Cuvier. $\beta\beta$ Mandibular teeth received within the margin of the maxilla. γ Muzzle elongate, nasal bones not reaching nares.Nasal bones reaching premaxillaries *Tomistoma* Müller. $\gamma\gamma$ Muzzle short, nasal bones reaching nares. δ Fourth mandibular tooth filling a notch in the upper jaw.No bony nasal septum *Crocodylus* Laurenti.No bony nasal septum *Osteolemus* Cope. $\delta\delta$ Fourth mandibular tooth received within the maxillary border (one exception).Claws three; a bony nasal septum; ventral scutes not or little ossified *Alligator* Cuvier.Claws three; no bony nasal septum; ventral scutes osseous; supratemporal foramen open *Jacare* Gray.Claws three; no bony septum; ventral scutes ossified; supratemporal foramen roofed over *Caiman* Spix.Claws two; no bony septum; ventral scutes ossified (roof over inferior canine wanting on one side) *Peroechus* Cope.

The genera *Thoracosaurus* and *Holops* are restricted, with present knowledge, to the Upper Cretaceous formations of North America. The other genera still exist, and are restricted to the warmer regions of the earth. *Tomistoma* is Malaysian; *Crocodylus* is cosmopolitan; *Osteolemus* is African, while the other genera are South American, except *Alligator*. This genus includes one North American and one east Asiatic species and one of unknown habitat. *Garialis* is Indian.

In North America we have to do with the widely distributed *Alligator mississippiensis* and the *Crocodylus americanus*, which ranges to the southern part of the peninsula of Florida from an extensive habitat in tropical America.

Many remarkable peculiarities characterize the osteology of this family.

The pterygoids have a very peculiar form. They are much expanded transversely posteriorly, resembling in this respect the Cotylosauria and some of the Theromora of the Permian, but with this the resemblance ceases. Near the middle line of the skull each one directs its free posterior margin upward, assuming the direction of the basicranial axis and, surrounding the posterior nares behind, unites with the inferior descending axis of the sphenoid by a transverse serrate suture. The pterygoid plate does not continue its vertical direction for long, but soon unites with the quadrate posteriorly and the alisphenoid anteriorly by a serrate suture. This union of the pterygoid with the proximal extremity of the quadrate, instead of the distal, is a specialization peculiar to this family among reptiles. The superior prolongation of the

zygomatic (quadratojugal) to the supratemporomastoid and postfrontal is equally peculiar to it. Another peculiarity is the non-entrance of the exoccipital bone into the occipital condyle. Another remarkable peculiarity is the union, a short distance below the brain case, of the Eustachian tubes into a single median vertical canal, which descends to the pharynx between the vertical axes of the basioccipital and sphenoid bones.

The mandibular ramus is characterized by the distinctness of all the elements and by two especial peculiarities. One of these is the absence of coronoid process, the coronoid bone being a scale on the interior side of the ramus. The other is the presence of a very large foramen between the angular and surangular bones on the external face of the ramus, which communicates with the large dental canal.

The vertebræ are procelous throughout. There are no intercentra except the chevron bones and a preatlantal element, which articulates with the lower part of the occipital condyle in front, and underlaps the *os entatum*, or centrum of the atlas; posteriorly. This first and only cervical intercentrum sends out, posteriorly and downward on each side, a long intercentral rib. The atlas consists of separate elements, viz, centrum, neurapophysis, and neural spine. The centrum is united by suture with that of the axis vertebra, and the neurapophyses are in contact anteriorly below with the intercentrum. They narrow upward to a squamosal suture with the neural spine, which is a thin, curved element. The cervical ribs are short, and unite with a parapophysis and diapophysis. The dorsal ribs have the capitular articulation on the centrum, and the tubercular on the diapophysis for a short distance, but the capitular articulation soon rises to the diapophysis, remaining distinct from the tubercular. There are two sacral vertebræ, and no sacral ribs.

There is no clavicle, proscapula, or epicoracoid. The coracoid is in contact with the anterior lateral border of the sternum. The suprascapula is represented by a cartilage. The ilium is short anteroposteriorly and does not extend anteriorly to the acetabulum, but does extend for a short distance posteriorly to it. The pubis is excluded from the acetabulum, articulating with the anterior base of the ischium. The pubes are directed forward and have no symphysis, being connected by cartilage only. They have no connection with the ischia on the median line. The ischia are directed downward to a median symphysis.

There are three elements in the proximal carpal series. Of these the radiale and intermedium support the foot, and are remarkable for their longitudinal elongation. The carpalia are more or less aborted. The tarsalia are remarkable for the specialization of the bones of the first row. They are two in number; the large astragalus consisting, apparently, of the tibiale and intermedium tarsi. The fibulare (calcaneum) has what has not been shown to exist elsewhere among Reptilia, a tuber

calcis. Both these elements have a distal convex condylar surface for the elements distal to them. The tarsalia are partially aborted.

No urinary bladder. A rudimental diaphragm. The viscera are more particularly described under the genus *Alligator*.

ALLIGATOR Cuvier.

Alligator CUVIER, part, Ann. Mus., X, 1807, p. 30.—DUMÉRIL and BIBRON, Etp.

Gén., III, 1836, p. 63.—STRAUCH, Syn. Crocod., 1866, p. 9.

Champsæ WAGLER, part, Syst. Amph., 1830, p. 140.

Alligator GRAY, Cat. Tort., 1844, p. 66.—HUXLEY, Journ. Linn. Soc., IV, 1860, p.

3.—GRAY, Cat. Sh. Rept., II, 1872, p. 28.

Fourth mandibular tooth fitting into a pit in the upper jaw. Snout rather short; nasal bones forming a septum dividing the nasal aperture; supratemporal fossæ open, splenial bones not entering the mandibular symphysis. A dorsal shield formed of juxtaposed, keeled, bony scutes; gular and ventral scutes without or with thin ossifications.

Osteology.—My knowledge of the osteology of this genus is derived exclusively from the *A. mississippiensis*.

Premaxillaries with the spine very short, and uniting by suture with the produced apices of the nasal bones. Lateral plate in considerable sutural union with the nasals posterior to the nares. Frontal produced in a narrow process between prefrontals. A small supraorbital bone anteriorly placed. Parietal-like frontal, undivided, not sending out supramastoid processes, and extending to the posterior border of the superior table of the skull. Supratemporo-mastoid sending out a latero-posterior process almost to the extremity of the exoccipital, and bounded below posteriorly by the quadrate, medially by the *meatus auditorius*, and anteriorly from before backward, by the quadrate, the superior process of the zygomatic, and by the postorbital part of the postfronto-orbital. Anteriorly it is bounded by the postfrontal part of the postfronto-orbital. The articular surface of the quadrate is directed as much backward as downward. The zygomatic reaches its distal extremity in front, while the jugal is continued three-fourths way from its first point of contact with the zygomatic to its extremity. The parieto-quadrate arch is not entirely fused with the elements lying below it, as it is not united with the supraoccipital by suture, except on the middle line. The lateral part of the superior border of the supraoccipital is a smooth tuberosity, and a foramen passes entirely below the supratemporo-mastoid bone to the supratemporal foramen. Another canal passes between the exoccipital and quadrate from behind forward and inward to the temporal fossa. The supraoccipital does not reach the *foramen magnum* below, but the latter is inclosed above by the exoccipitals. The latter do not enter into the composition of the occipital condyle, which consists entirely of the basioccipital.

The quadrate is remarkably extended forward. Below, it sends down a broad process to join the pterygoid, medially it joins the

petrosal, while above it joins the alisphenoid, and to a less degree the parietal. In its junction with the petrosal it overlaps that bone so far as to almost exclude it from the external wall of the brain case, and it can only be seen by looking within the posterior border of the trigeminal foramen. The alisphenoid is well developed, and joins above the decurved border of the parietal posteriorly, the postfrontal medially, and the frontal anteriorly. The alisphenoids meet on the middle line, leaving a large foramen above for the rhinencephalon, and a large 8-shaped foramen below. The inferior part of the latter is immediately posterior to the keel-like anterior process of the sphenoid. A strong process descends to the pterygoid, bounding the trigeminal foramen in front. This represents the epipterygoid of the Sauria. No orbito-sphenoid or other interorbital bone.

The anterior half of the basioccipital has its longitudinal axis vertical. The long axis of the sphenoid is also vertical. The medullary part of the brain case is roofed by the exoccipitals only, but the supra-occipital bounds the epencephalon above. The petrosal is much more conspicuous on the internal than on the external wall of the brain case. It is suboval, and is bounded by the alisphenoid, sphenoid, exoccipital, supraoccipital, and to a small degree by the parietal. It is deeply notched in front by the trigeminal foramen. Although the sphenoid is mainly vertical in position it sends forward between the alisphenoids a vertically compressed plate, already mentioned. The occipital and sphenoid elements are coarsely cellular at various points. The pterygoids unite together on the median line and join the sphenoid behind the posterior nares. The pterygoids send forward a process above the palatines to the front of the orbits, where they cease. Here a strong process of the prefrontal descends on each side and rests on the adjacent parts of the palatine and pterygoid. These processes are separate on the middle line above and below, but touch at the middle of their length. The ectopterygoids are large and each sends a process forward on the maxillary, and a longer one on the pterygoid. The palatine and maxillary bones are in mutual contact on the middle line, and no part of the vomer or ethmoid is visible on the external surface.

The mandibular ramus has a rather elongate angle, which has its superior concave surface divided lengthwise by an obtuse ridge. The articular bone forms the greater part of the angle, the angular being a narrow strip on its inferior side, which forms the apex, the surangular sending a narrow splint on the external side, which does not extend so far as the two other elements. The cotylus is not divided by a ridge, but a transverse section is gently sigmoid, descending inward. The coronoid is a large scale in front of the very large dental foramen, and does not extend anterior to the vertical line of the angular. A large foramen is inclosed between the latter and the splenial. The latter element forms the entire internal side of the ramus, terminating acutely below and within the fourth tooth. The groove in front of its apex is

closed with a straight suture at the fundus. There is a foramen on the inner side of the splenial opposite the eighteenth tooth, counting from the front. The angular extends farther forward than the surangular, and its narrow apical portion is on the inferior face of the ramus, terminating at the eighteenth tooth.

In young specimens the posterior alveoli are not separated from each other, and the crowns of the teeth are more compressed than in adults.

The atlantal neural spine has no spinous process, but it is well developed on the other vertebrae. The atlas sends posteriorly a slender rib, which is slightly bifurcate proximally. The other cervical ribs send a distal process forward as well as backward. The dorsal ribs have a small cartilaginous uncinat process near their distal extremities. The abdominal ribs consist of four ossicles, forming a chevron directed forward. The interclavicle has no transverse branch, and extends well in advance of the sternum and nearly to its posterior border. The hæmal ribs unite with the sternum, as follows: Two pairs unite directly, and four pairs with a median xiphoid cartilage.

The coracoid is an elongate element, distally truncate, without notches or processses; the usual foramen pierces it near the base. The scapula is of somewhat similar form; it has no pro- or meso-scapular process or angle. The humerus has one compressed tuberosity at a considerable distance distad of the head. The distal extremity much resembles that of the femur. The ulna is robust proximally, and the olecranon is represented by a large sesamoid bone. The shaft of the radius less compressed than that of the ulna, but is not very different in actual sectional area. Its distal articular surface is a little larger than that of the ulna, and is at nearly a right angle to it. In the carpus the radiale is a much larger bone than the intermedium, but both are similar in form, being much longer than wide, and having expanded extremities and contracted shafts. Their distal articular faces are concave. The ulnare projects freely backward. There is but one carpale, and that corresponds with the third digit. The I and II are represented by a cartilage. No centrals. Digits five, of which the third is longest and the fifth shortest. The I, II, and III only have the distal phalanges unguiform and sheathed with horny claws.

The ilium projects as far as the diapophysis of the first caudal vertebra but does not fuse with it. The proximal end of the ischium is deeply notched, which causes a perforation of the acetabulum. The femur is longer than the humerus and the head is less compressed. There is no distinction into the head and neck. There is but one trochanter and that is on the posterior aspect and presents its tuberosity distad. The condyle of the femur is not divided; no patella. The fibula is much more slender than the tibia at all points. The astragalus articulates with the fibula as well as with the tibia; its face of articulation with the calcaneum is excavated. The latter has a convex fibula surface, while the tibial surface of the astragalus is concave. Posterior to the fibular condyle the calcaneum is excavated, and the *tuber calcanei* is

somewhat recurved at the apex. It is obliquely truncate behind and below. The inferior face is excavated and the distal plane. There are three tarsalia corresponding to four external digits; the first digit articulating directly with the astragalus, the second digit joins one tarsale, the third and fourth one, while the fifth digit is lacking. The fifth tarsale is produced like a rudimental metatarsal. The three interior digits only have unguiform distal phalanges with corneous sheaths.

Viscera.—The heart is situated in the anterior part of the body cavity, and the lungs extend about half their length posterior to it. The latter extend considerably cephalad of the bronchi, which enter at about the posterior third of their length, at right angles to the axis of the body. The liver is completely divided into right and left moieties, each of which sends posteriorly a process of its external portion. The alimentary canal is distinguished for the strong differentiation of the stomach, which much exceeds anything known in the Sauria. The cardium and pylorus are each small orifices, and the stomach has a fundus at either end external and caudad to each. Toward the pyloric fundus the walls are very thick with muscle. At its apex is a small diverticulum in the *A. mississippiensis*. The small intestine is of relatively small diameter and the large intestine is large, and is not distinguished into colon and rectum, and has no cæcum. The kidney is coarsely lobate.

The mesenteries are not so simple as in the Sauria, as they are less distinct from each other, and send branches in different directions. The œsophagus has, besides the dorsal connection, connection with the pericardium. The lungs are connected with both, and distally with the cephalad surface of the liver. The liver has connection posteriorly with all of these viscera, which is not muscular, but which represents the dorsal part of the pericardium. A longitudinal fold connects the pericardium with the two halves of the liver and the stomach, representing the gastrohepatic mesentery of the Sauria. From the caudad margin of the liver on the right side a sheet extends to the body wall, remaining free from the latter as far posteriorly as the kidney. A corresponding sheet extends from the distal aspect of the stomach on the right side. Both are connected with the body wall by bands and threads. From each lobe of the liver near the median line a sheet extends to the median body wall below, which is strongly muscular. This is regarded as homologous with the inferior portion of the diaphragm of the mammals, and this with the posterior transverse hepatodorsal sheet may correspond with that structure. If so, the important difference remains that in the alligator it includes the liver between its two layers, while in the mammals it is entirely superior to the liver.

The tympanic drum is deeply set beneath the superior postorbital bar. It is protected by a fold of the integument which forms a flap, which is suspended from the postorbital bar, closing the orifice like a lid.

Geologic history.—The genus *Alligator* is of much more modern origin

than *Crocodylus*, no undoubted extinct species having been discovered. The neocene *Crocodylus spencerii* of England has been found to vary in the direction of *Alligator*, and on such an individual was proposed the *A. hantoniensis*, but the characters are said not to be normal.

Species.—Three species of this genus are known. One is the North American; the other is found in China, and the habitat of the other is unknown. Their characters are as follows:

The broadest series of dorsal scutes composed of eight scutes; four large nuchal scutes; upper eyelid bony anteriorly; fingers webbed; end of tail strongly compressed and crested.....*A. mississippiensis* Daudin.

The broadest transverse series of dorsal scutes composed of eight scutes; two large nuchal scutes; fingers free; end of tail little serrated above, scarcely compressed.

A. helois Cope.

The broadest transverse series of dorsal scutes composed of six scutes; six large nuchal scutes; upper eyelid entirely bony; fingers free; end of tail strongly compressed and crested.....*A. sinensis* Fauvel.

ALLIGATOR MISSISSIPPIENSIS Daudin.

Alligator mississippiensis GRAY, Syn. Rept., 1831, p. 62.—HOLBROOK, N. Am. Herp., II, 1842, p. 53, pl. VI.—GRAY, Cat. Tort., 1844, p. 66.—STRAUCH, Syn. Crocod., 1866, pp. 15, 66.—GRAY, Trans. Zool. Soc., VI, 1869, p. 168; Cat. Sh. Rept., II, 1872, p. 29.—CHAFFANJON, Ann. Soc. Linn. Lyon, XXVIII, 1882, p. 83.

Crocodylus mississippiensis DAUDIN, Rept., II, 1802, p. 412.

Crocodylus lucius CUVIER, Ann. Mus., X, 1807, p. 32; Ossements Fossiles, V, Pt. 2, 1824, p. 32, pls. I, II.—TIEDEMANN, OPPEL, and LIBOSCHITZ, Nat. Amph., 1817, p. 58, pl. IV.—HARLAN, Med. Zool. Res., 1835, p. 146.

Crocodylus cuvieri LEACH, Zool. Misc., II, 1815, p. 117, pl. CII.

Alligator lucius BORY DE ST. VINCENT, Dict. Class. d' H. N., V, 1824, p. 100.—DUMÉRIL and BIBRON, Erp. Gén., III, 1836, p. 75, pls. XXV, XXVI.

Alligator cuvieri BORY DE ST. VINCENT, Dist. Class. d' H. N., V, 1824, p. 104.

Nineteen or twenty upper and as many lower teeth on each side; head nearly twice as long as broad; snout much depressed, broadly rounded at the end, with the lateral outline nearly straight; a very short ridge in front of the orbit; upper eyelid bony anteriorly; two pairs of large nuchal scutes, forming a square, separated on the median line, with a pair of small ones in front and another pair behind; seventeen or eighteen transverse series of dorsal scutes, the broadest composed of eight scutes; fingers hardly half webbed, outer toes about two-thirds webbed; tail strongly compressed and crested posteriorly. Dark green or blackish above, young with yellowish cross bands, lower parts yellowish.

Total length, 2 meters 20 centimeters; reaches a length of $4\frac{1}{2}$ meters (about 16 feet).

In young specimens, of a meter in length, the anterior parts of the nasal and maxillary bones present coarse, flat tuberosities, while the middle parts of those bones are nearly smooth. In adults the former regions are nearly smooth, while the latter are pitted, producing a shallow honeycombed surface. The posterior parts of the same bones

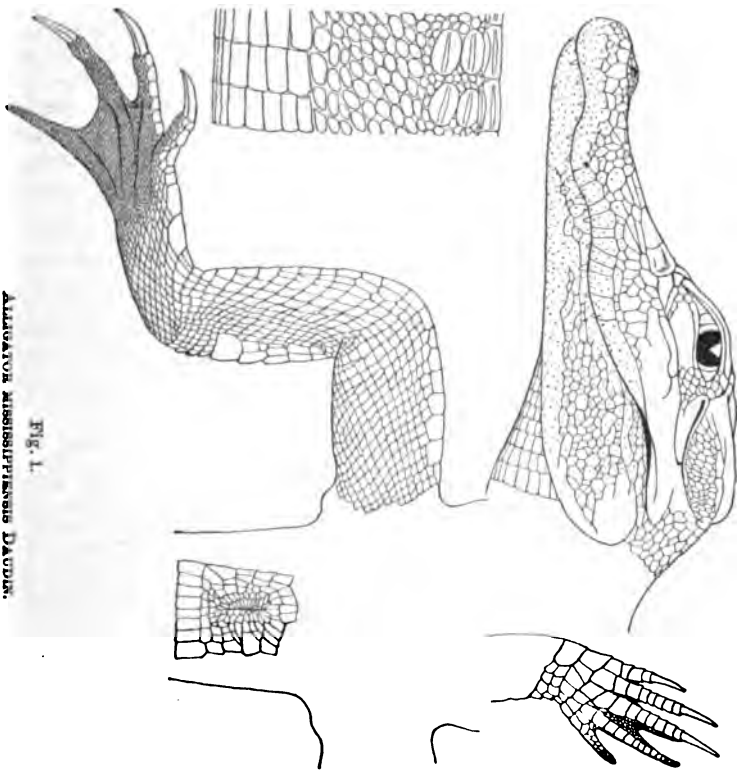
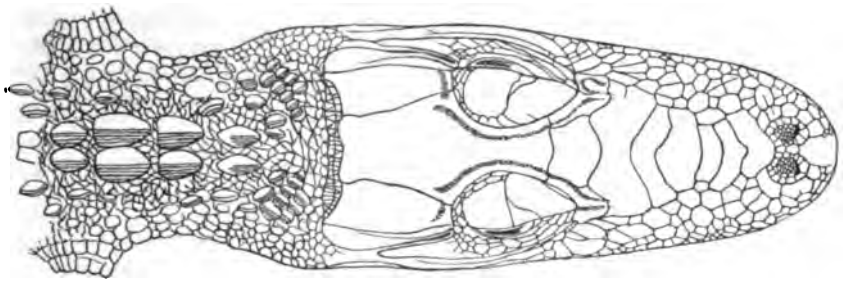
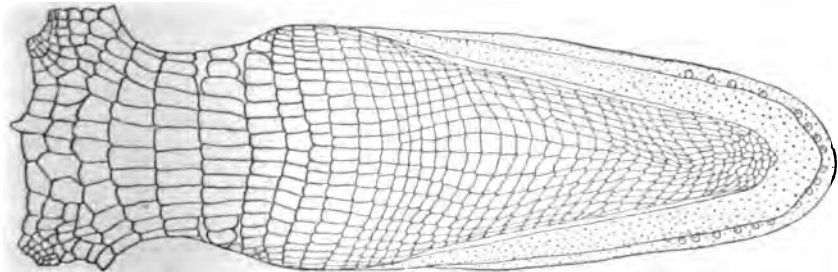


Fig. 1.
ALLIGATOR MISSISSIPPENSIS DAUDIN.
= 1.
From a young specimen from Volusia, Florida.



are nearly smooth, or feebly ridged longitudinally. The frontal, post-frontal, parietal, and supratemporo-mastoid are always pitted. There is a low longitudinal median ridge of the frontal bone between the anterior parts of the orbits. The olfactory groove of the frontal is narrow, and their lateral walls robust and low. The posterior part of the surangular bone is honeycombed, while the dentary is smooth, but is perforated by numerous small foramina.

The vertebræ number as follows: C., 8; D., 10; L., 7; S., 2; C., 36. The neural spines of the cervicals are narrower anteroposteriorly than those of the dorsals, except that of the axis, which is much the longest, but is not more elevated than the others. The hypapophysis of the second cervical is very low, but those of the other cervicals and of the anterior four dorsals are well developed; there is a low one on the fifth dorsal. The mutual surfaces of the centra of the second sacral and first caudal are flat. But three of the ribs articulate with the vertebral centra, the remainder having the capitular articulations with the diapophyses at increasing distances from their bases. Of the caudal vertebræ the anterior 18 have diapophyses. The first and second have no chevrons, which are present on the following 21. The terminal centra are much compressed. The last abdominal rib is much more robust than the others. It is similarly composed and posteriorly joins the pubes at their bases. The phalanges are as follows: Manus, 2-3-4-3-3; pes, 2-3-4-3. These details are derived from a skeleton in the museum of the School of Biology of the University of Pennsylvania.

The alligator is characteristic of the Austroriparian region, ranging from North Carolina to the Rio Grande of Texas. I have examined crania of individuals taken in the Nueces River, Texas, and do not find them to differ in any respect from those taken in Florida.

As regards the range of the alligator up the Mississippi, I have gained the following information through my friend, Mr. Julius Hurter, of St. Louis, who has for many years made a study of the batrachians and reptiles of Missouri. He states that the oldest residents of the southeastern county of that State have no knowledge of the occurrence of the species in that locality. The most northern locality with which Mr. Hurter is personally acquainted is Rodney, Jefferson County, Miss., about latitude 32°.

Dr. Hugh M. Smith,¹ of the United States Fish Commission, says that—

The maternal alligator in April or May seeks a sheltered spot on a bank and there builds a small mound. The foundation of the mound is of mud and grass, and on this she lays some eggs. She covers the eggs with another stratum of grass and mud, upon which she deposits some more eggs. Thus she proceeds until she has laid from 100 to 200 eggs.

The eggs in the course of time are hatched by the sun, assisted by the heat which the decomposition of the vegetable material generates. As soon as they have "chipped the shell," the baby alligators are led to the water by the mother, who

¹ Bulletin, U. S. Fish Commission, XI, 1891, p. 343. Washington, 1893.

provides them with food which she disgorges, showing much anxiety for their safety. At this early period of their existence they are exposed to many dangers, being a favorite prey of fishes and turtles. Alligators' eggs are sometimes eaten by the Florida crackers. The robbing of the nests for market is helping to hasten the inevitable destruction of the alligator fishery, which has been an important and profitable industry in Florida. Facts recently gathered by the Fish Commission show that the reptiles can not long escape practical extermination. Already they are becoming scarce, and the price of hides has gone up.

It is estimated that 2,500,000 alligators were killed in Florida between 1880 and 1894.

In 1890 about 250 pounds of alligator teeth were sold, hunters receiving from \$1 to \$2 a pound for them. They are removed by burying the heads and rotting out the teeth. Of the best teeth, about seventy make a pound. The stuffing of alligators and the polishing of the teeth give employment to forty persons. Unfortunately, alligators grow very slowly. At 15 years of age they are only 2 feet long. A 12-footer may be reasonably supposed to be 75 years old.

The artificial propagation of alligators has been recently undertaken to supply the trade in Florida curiosities.

The incubator system employed is quite simple. The eggs, which are about the size of those of a goose, are placed in boxes of sand and covered up. The boxes are exposed on a roof to the torrid rays of a tropical sun, and in a few days the young reptiles are hatched.

Alligator mississippiensis Daudin.

Catalogue number.	Locality.	Donor.
14803.....	Tampa, Florida	Charles R. Ellis.
17921.....	Florida	R. Boyne.
21361.....	Tampa, Florida	U. S. Fish Commission.

CROCODILUS Laurenti.

Crocodylus LAURENTI, Syn. Rept., 1768, p. 53.—STRAUCH, Syn. Crocod., 1866, p. 28.—CUVIER, Ann. Mus., X, 1807, p. 40.—WAGLER, Syst. Amph., 1830, p. 40.—DUMÉRIL and BIBRON, Erp. Gén., III, 1836, p. 93.—GRAY, Cat. Tort., 1844, p. 58.—HUXLEY, Journ. Linn. Soc., IV, 1860, p. 6.—GÜNTHER, Rept. Brit. Ind., 1864, p. 60.—GRAY, Cat. Sh. Rept., II, 1872, p. 14.

Champsæ MERREM, Tentamen Systematis Amphibiorum, 1820, p. 36.

Mecistops GRAY, part, Cat. Tort., p. 57.

Opholis GRAY, Cat. Tort., p. 58; Cat. Sh. Rept., II, p. 8.

Palinia GRAY, Cat. Tort., p. 60; Cat. Sh. Rept., II, p. 13.

Molinia GRAY, Cat. Tort., p. 60; Cat. Sh. Rept., II, p. 17.

Mecistops HUXLEY, Journ. Linn. Soc., IV, p. 15.—GRAY, Cat. Sh. Rept., II, p. 21.

Bombifrons GRAY, Ann. and Mag. N. H. (3), X, 1862, p. 269; Cat. Sh. Rept., II, p. 9.

Temsacus GRAY, Cat. Tort., p. 272; Cat. Sh. Rept., II, p. 18.

Philas GRAY, Proc. Zool. Soc., 1874, p. 177.

Fifth maxillary tooth largest, the fourth mandibular usually fitting into a notch in the upper jaw. Snout more or less elongate; nasal bones extending to the nasal aperture, which is undivided and larger than the supratemporal fossae; a very small anterior bony plate in the upper eyelid. Splenial bones not entering the mandibular symphysis. A dorsal shield formed by four or more longitudinal series of juxtaposed, keeled, bony scutes. Africa, Southern Asia, North Australia, Tropical America.

Concerning this genus Boulenger remarks:¹

Notwithstanding all that has been written on the specific characters of the crocodiles, their distinction and definition remains a matter of considerable difficulty. Although the extreme forms, viz, *C. cataphractus* and *C. palustris*, differ very widely, the passage is so complete as to render even subgeneric divisions unadvisable. The following key will, I hope, suffice in most cases for the exact determination of the species, except with respect to newly born specimens, which can only be named by comparison with older examples.

Boulenger then gives the following table of the species:

- I. Snout very slender, gavial-like, at least twice as long as broad at the base; mandibular symphysis extending to the level of the sixth, seventh, or eighth tooth; premaxillo-maxillary suture, on the palate, produced posteriorly.
 - Nuchal scutes in two longitudinal series, continuous or subcontinuous with the dorsals *C. cataphractus* Cuvier.
 - Nuchal scutes six, four in a square with one on each side, subcontinuous with the dorsals *C. johnstonii* Krefft.
 - Nuchal scutes six, four in a square with one on each side, widely separated from the dorsals *C. intermedius* Graves.
- II. Snout more than once and a half, and not more than twice and a one-fourth as long as broad at the base; mandibular symphysis extending to the level of the fourth or fifth tooth; premaxillo-maxillary suture, on the palate, produced posteriorly.
 - A. No longitudinal ridge in front of the eye; anterior nuchal scutes (post-occipitals) well developed.
 - A longitudinal swelling or ridge along the middle of the snout. *C. americanus* Laurenti.
 - A longitudinal ridge between the orbits, none on the snout. *C. siamensis* Schneider.
 - No ridges on the forehead or snout. *C. niloticus* Laurenti.
 - B. A longitudinal ridge in front of the eye; anterior nuchals usually absent. *C. porosus* Schneider.
- III. Snout not more than once and a half as long as broad at the base; mandibular symphysis extending to the level of the fourth or fifth tooth, premaxillo-maxillary suture, on the palate, transverse or curved forward.
 - A. Snout without ridges.
 - Dorsal shield usually composed of four longitudinal series of scutes, the median of which are broader than long. *C. palustris* Lesson.
 - Dorsal shield composed of six longitudinal series of scutes in the middle. *C. robustus* Vaillant and Grandidier.
 - B. A more or less distinct oblique ridge in front of the eye.
 - Scales on upper surface of limbs keeled. *C. rhombifer* Cuvier.
 - Scales on limbs perfectly smooth *C. moreletii* A. Duméril.

Species of this genus are abundant in the Cenozoic formations from the Eocene onward, but they become rarer in the later beds. The above-mentioned existing species are distributed as follows:

Neotropica.	Ethiopica.	Indica.
<i>C. americanus.</i>	<i>C. cataphractus.</i>	<i>C. siamensis.</i>
<i>C. intermedius.</i>	<i>C. niloticus.</i>	<i>C. porosus.</i>
<i>C. rhombifer.</i>	<i>C. robustus.</i>	<i>C. palustris.</i>
<i>C. moreletii.</i>		
	Australasica.	
	<i>C. johnstonii.</i>	

¹ Cat. Chelonians, Rhynchocephalians, and Crocodiles, Brit. Mus., London, 1889, v. 277.

CROCODILUS AMERICANUS Laurenti.

- Crocodylus americanus* LAURENTI, Syn. Rept., 1768, p. 54.—SCHNEIDER, Hist. Amph., II, 1801, p. 23.—GEOFFROY, Ann. Mus., II, 1803, pl. xxxvii, fig. 1.—GRAY, Cat. Tort., 1844, p. 60.—HUXLEY, Journ. Linn. Soc., IV, 1860, p. 11.—BOCOURT, Miss. Sc. Mex. Rept., 1870, p. 30, pls. viii, fig. 1; ix, fig. 1.—GÜNTHER, Biol. C. Amer. Rept., 1885, p. 19.
- Crocodylus acutus* CUVIER, Ann. Mus., X, 1807, p. 55, pls. i, ii.—GEOFFROY, Ann. Mus., X, 1807, p. 70.—TIEDEMANN, OPPEL, and LIBOSCHITZ, Nat. Amph., 1817, p. 78, pl. xiii.—DUMÉRIL and BIBRON, Erp. Gén., III, 1836, p. 119.—COCTEAU in R. de la Sagra, Hist. Cuba Rept., 1843, p. 62, pl. v.—STRAUCH, Syn. Crocod., 1866, pp. 56, 102.—WYMAN, Amer. Journ., XLIX, 1870, p. 105.
- Crocodylus biscutatus* CUVIER, Ann. Mus., X, 1807, p. 53, pl. ii, fig. 6.—TIEDEMANN, OPPEL, and LIBOSCHITZ, Nat. Amph., 1817, p. 77, pl. xii.
- Molina americana* GRAY, Ann. Mag. Nat. Hist. (3), X, 1862, p. 272; Trans. Zool. Soc., VI, 1867, p. 150; Cat. Sh. Rept., II, 1872, p. 17.
- Crocodylus pacificus* BOCOURT, Miss. Sc. Mex. Rept., 1870, p. 31, pl. ix, fig. 5.
- C. lewyanus* BOCOURT, Miss. Sc. Mex. Rept., p. 33, pl. viii, fig. 2.
- C. mexicanus* BOCOURT, Miss. Sc. Mex. Rept., p. 34, pl. viii, fig. 3.
- C. floridanus* HORNADAY, Amer. Nat., IX, 1875, p. 504, figs. 211-213.

Eighteen or nineteen upper teeth on each side. Snout variable in length, one and three-fifths to two and one-fourth as long as broad at the base; a median ridge or longitudinal swelling along the snout; mandibular symphysis extending to the fourth or fifth tooth; premaxillo-maxillary suture, on the palate, directed backwards; maxillaries forming a short median suture above or narrowly separated by the nasals. Usually four large nuchals forming a square, with a smaller one on each side of the anterior pair; the large nuchals sometimes followed by one or two detached pairs of smaller scutes; usually two pairs of smaller nuchals in a transverse row behind the occiput. Dorsal scutes well separated from the nuchals, in fifteen or sixteen transverse and four or six longitudinal rows; the scutes of the two median rows regularly arranged, the others more or less irregular and more strongly keeled; sides with scattered keeled scutes. A slight web between the second and third fingers; outer toes extensively webbed. A serrated fringe on the outer edge of the leg; scales on the limbs keeled. Blackish olive above, yellowish inferiorly; young pale olive, dotted and spotted with black. (Boulenger.)

The largest specimen in the collection measures $3\frac{1}{2}$ meters.

Ecuador, Colombia, Venezuela, Central America, Southern Mexico, West Indies, Florida.

This species varies a good deal in the number and arrangement of the nuchal scutes. Specimens from Tehuantepec, on the west coast of Mexico, exhibit from two to four nuchal scuta and from two to five cervical. Several specimens present the irregularity of having scuta of the external dorsal series to join on the middle line of the back, replacing the median row of scutes at those points.¹

¹ Proceedings, American Philosophical Society, XI, 1869, p. 161.

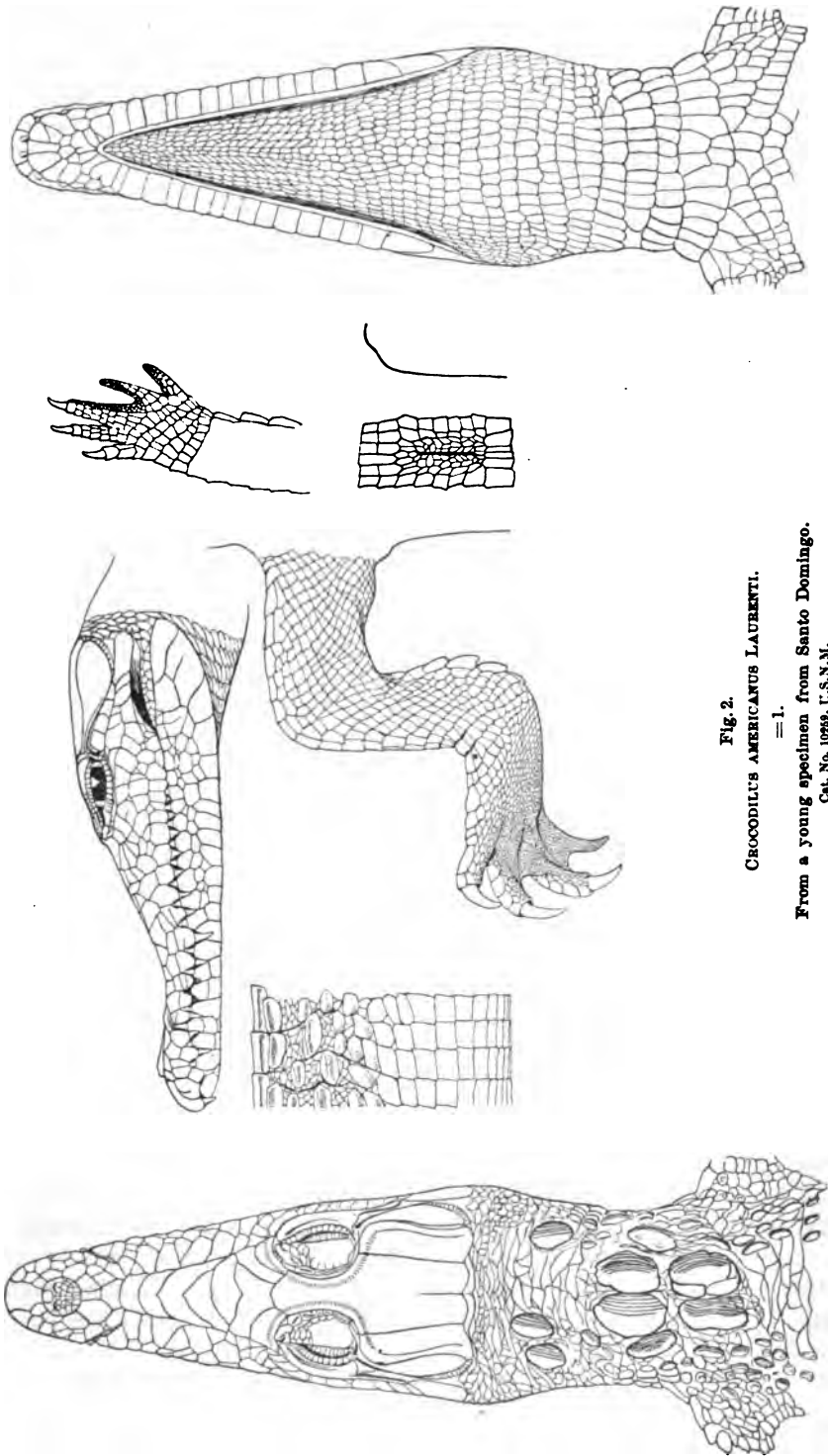


Fig. 2.
CROCODILUS AMERICANUS LAURENTI.
= 1.
From a young specimen from Santo Domingo.
Cat. No. 10559, U.S.N.M.

Mr. W. T. Hornaday originally observed this species to be an inhabitant of the seacoast, streams, and lakes of southeastern Florida,¹ ranging north as far as Lake Worth, a hundred miles north of the southern extremity of the State. From this point Mr. Ward, of Rochester, New York, obtained a specimen 9 feet in length. Mr. Hornaday supposed these individuals to represent a species different from that of more southern waters, but I have been unable to detect any difference. The largest specimen he obtained measured 14 feet in length.

In its preference for salt water this species differs from the alligator. It is said also to be more vicious in its disposition. A specimen between 4 and 5 feet in length was once sent me by my late friend, Professor Poey, of Havana. I kept it tethered in a yard and observed its manners. It was ill-natured and not afraid to attack either by snapping its jaws or striking with its tail.

A specimen of this species was sent to the National Museum from Mazatlan, on the coast of Sinaloa, Mexico. This is the nearest point to the Nearctic realm at which it has been found on the Pacific coast.

SQUAMATA.

1. GENERAL ANATOMY.

No quadratojugal (zygomatic) arch; quadrate therefore articulated by its proximal extremity only. No os tabulare. Paroccipital present; opisthotic early fused with the supramastoid, probably fused with the parietal. Nostrils, both external and internal, subterminal. Maxillopalatines, palatines, and pterygoids distinct, paired; ectopterygoid present and distinct. Teeth on maxillary and dentary bones. Stapes with a long shaft, or columella, terminating in a cartilage.

Vertebral centra procelous, rarely amphicelous; caudals with chevrons. Neural arches coossified with centrum, except atlas, which has neurapophyses separate from body and from each other; odontoid process distinct. Not more than two vertebrae in sacrum. Cervical ribs. Dorsal ribs single (i. e., tubercular) headed, articulating with diapophyses; one to several pairs articulating with sternum. No sacral ribs. No tegumentary abdominal bones.

Scapular arch, when developed, consisting of suprascapula, scapula, precoracoid, coracoid, clavicle, and interclavicle; frequently a proscapula. The scapula is not coossified with the other elements. Coracoid articulating with the simple plate-like sternum. Pelvic arch, when complete, embracing the three elements, which inclose below a large obturator foramen. Ilium directed backward and upward.

Brain with large olfactory lobes, which are not as large as the hemispheres. The latter are larger than the thalami, and their ventricles are on the external side of their nucleus (corpus striatum). Thalami exposed above as well as laterally. Cerebellum small, without flocculi.

¹ American Naturalist, IX, 1875, p. 498.

Central canal of spinal cord present. The eye possesses the usual character of the Monocondylia in the presence of the pecten, which extends from the choroidea to the sheath of the lens. It is not so plicate as in birds. The organ of hearing conforms to the same type in the absence of a helix and the presence of a lagena and sacculus. The sympathetic nervous system is well developed and presents the series of subvertebral ganglia.

The alimentary canal is little specialized in the different parts of its course, but the stomach is distinguished by its greater diameter and generally more muscular walls. The diameter of the rectum generally exceeds that of the preceding parts of the canal. Gall bladder and pancreas present. Adipose bodies present.

Heart with three chambers; two auricles and one ventricle. The latter gives origin to a truncus communis arteriosus, which sends off one or two aorta bows on each side, which combine to form a single aorta root on each side, which fuse into the single aorta on the middle line below the vertebral column. A sinus venosus. Posterior vena cava, formed from the renal veins and traversing the liver after receiving the portal vein. It is received, together with two jugulars, into the sinus venosus. Posterior vertebral veins running below the ribs.

Sexes distinct. Testis and vas deferens distinct from renal ducts, discharging separately into cloaca. Males with two prehensile organs, each inclosed in a sheath, one on each side of the base of the tail. They are everted toward the cloacal orifice when in use and are retracted by invagination by the contraction of an axial muscle. They are traversed by a groove, the sulcus spermaticus, which, beginning at the base on the inner side, winds to the apex on the outer side, uniting into a short, common vagina opening into the cloaca from above to receive the male prehensile organs. Oviducts distinct. The oviduct consists of a tube, which, when not containing eggs, is collapsed, falling into numerous parallel, transverse folds. These folds are held in place by an elastic band on each opposite border. The margin of the fontanelle is of delicate membrane, and it is attached to the body wall by a delicate fold of peritoneum.

The integument is characteristically divided into small areas or scales, by confluent inflections. These are occasionally the seat of osseous deposit (Scincidae, Gerrhonotidae), but this is exceptional. No osseous scuta, other than the cases mentioned. This description applies as well to the extinct Pythonomorpha as to the Sauria and Ophidia. Abdominal scales generally different from the dorsal.

The integument of the head is divided in many types into plates of definite relations, which are homologous throughout the various subdivisions, and even between the suborders of Sauria and Ophidia. In general, it may be believed that these plates have resulted from the fusion of scales, both because scales are the primitive covering of the body and are less specialized than the head plates, but also because

the types of affinity with the extinct types have scaly heads; for instance, the *Sphenodon* of the Rhynchocephalian order is approached closely in scale characters by the *Pachygloss* lizard. The Boidæ, among snakes, recognized as the most primitive forms, also have generally scaly heads and few or no plates. The scaly head also characterizes some of the higher types of snakes, as many *Solenoglypha*, as well as the degenerate *Epanodonta* and *Catodonta*; while most of the degenerate *Sauria* have head plates, but more or less fused.

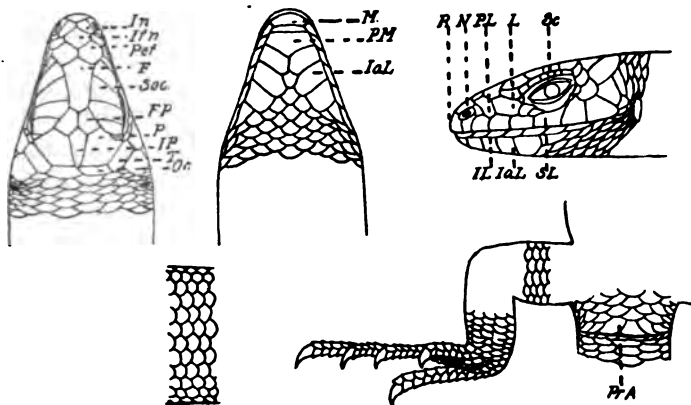


Fig. 3.

DETAILS OF *EUMECES QUINQUELINEATUS* LINNÆUS (female).

Cat. No. 9953, U.S.N.M.

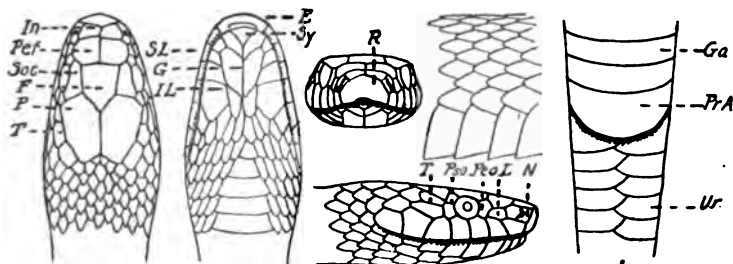


Fig. 4.

DETAILS OF *OSCEOLA DOLIATA* SYMPILA COPE.

Cat. No. 13361, U.S.N.M.

R, rostral plate; *In*, internasal; *In*, interfrontonasal; *Pef*, prefrontal; *F*, frontal; *Soc*, supraocular; *Fp*, frontoparietal; *P*, parietal; *IP*, interparietal; *Oc*, occipital; *M*, mental; *PM*, postmental; *IaL*, infralabial; *N*, nasal; *PL*, preloreal; *L*, loreal; *Sc*, superciliary; *T*, temporal; *Sy*, symphyseal; *G*, genial; *Pso*, preorbital; *Pso*, postorbital; *PrA*, preanal; *Ga*, gastrosteges (scuta); *Ur*, urosteges (scutella).

The nomenclature of these plates is explained on the above cuts of the heads of a Scincoid lizard and a Colubrine snake.

2. DISTRIBUTION AND HABITS.

The Squamata are found in all except the Arctic and Antarctic regions of the earth. Their numbers, both in species and individuals, increase as we approach the Tropics. They are preeminently terrestrial animals, and are never found far from shore, excepting certain snakes which live in the ocean. On land they inhabit all localities that supply food and shelter, whether in trees, on the surface of the earth, or beneath the surface, or along the shores of bodies of water. They are for the greater part carnivorous, but certain lizards and a very few snakes are herbivorous.

The Squamata, like other reptiles, possess much muscular power, and above all others many of them are capable of great speed of motion. Many of the arboreal species climb with wonderful rapidity, and others get over the ground with great swiftness. Such are especially the Teiidae, or swift lizards, who are almost invisible when running, and some of the snakes. A few lizards (*Amblyrhynchus*) are good swimmers, while along all bodies of fresh water dwell snakes which are such expert swimmers that they readily capture the fishes on which they prey. The prehensile power of the Peropodous snakes is well known, enabling them to kill small and medium-sized mammals by involving them in their coils. Certain of the snakes have none of the remarkable powers of speed, prehension, or swiftness possessed by others, but are protected by a formidable poisonous biting apparatus, which enables them to inflict mortal wounds on their prey, and which places them in the front rank of dangerous animals.

The Squamata exhibit a low order of intelligence. Most of them give few exhibitions of it, and it is then generally in connection with obtaining food. They sometimes appear to recognize the person that feeds them, and will overcome their timidity so far as to take food from the hand. I give an account, under the head of *Liopeltis vernalis*, of a ruse adopted by this species for the purpose of taking prey; and under *Heterodon platyrhinus*, of actions apparently intended to inspire fear in a venomous snake with which it was confined.

3. CLASSIFICATION.

The Squamata are known under three principal modifications or sub-orders, as follows:

- Quadrato bone articulating with exoccipital; parietal bones not closing the brain case in front; generally an epipterygoid and sternum; teeth with dentinal roots; phalanges with condyles.....SAURIA.
- Quadrato bone articulating with paroccipital; parietal bones not closing brain case in front; epipterygoid and sternum present; teeth with osseous roots; phalanges truncate.....PYTHONOMORPHA.
- Quadrato bone articulating with paroccipital; parietal and frontal bones closing brain case in front; no epipterygoid or sternum; teeth rootless; no phalanges.....OPHIDIA.

Of these three suborders, the *Pythonomorpha* is extinct, having begun and ended with Cretaceous time. The *Sauria* and *Ophidia* are the subjects of the present work. Both begin in Cretaceous time, so far as our present knowledge extends, but it is at the existing geologic period of time that they present the greatest multiplication of individuals and species. This statement is, of course, provisional and dependent on future discoveries in paleontology for its verification or contradiction.

The superficial characters given by systematic writers generally as distinguishing the *Sauria* and *Ophidia* are quite insufficient for that purpose. Johannes Müller¹ first placed the distinction on a sound basis by showing that in the *Ophidia* the frontal and parietal bones descend to the basi-cranial axis as in no other vertebrates, thus closing the brain case in front, while in the *Sauria* this does not occur, and as the ali- and orbito-sphenoid bones are rudimental or wanting, the brain case is without osseous wall in front. Some lizards present a distinct approximation to the ophidian type in the strong decurvature of the parietal bones at the sides; these are the *Annulati* and the *Annielloida*. These groups display a similar approximation in the continuous sutural union of the occipital and parietal elements, a condition universal in *Ophidia* and rare in *Sauria*.

I have pointed out² another point of distinction between the two divisions, viz, that the supratemporal ("squamosal" *olim*) is present in the *Sauria* and absent in the *Ophidia*. As it is, however, absent in the *Annielloida* and *Amphisbænia*, I have not included it in the definition of the former suborder. This definition has not been adopted by those authors who erroneously regard the suspensorium of the quadrate bone in the *Ophidia* as identical with the supratemporal of the lizards. I pointed out in the above essay (1871) that this element in the snakes is homologous with the paroccipital of the *Sauria*, an opinion which was not agreed with at that time, but which has now received the assent of various anatomists, notably Professor Baur.

Baur and some others do not, however, agree that the element in question is the paroccipital, but call it squamosal and other names. I was led to identify it with the former element of the *Testudinata*, etc., by a consideration of its structure in the *Pythonomorpha*,³ where it is much more largely developed than in the *Sauria*, and where it supports the quadrate bone as in the *Ophidia*, which it does not do, or does only partially in a few cases, in the *Sauria*. I have made this more clear than heretofore I hope in a recent essay.⁴ The paroccipital bone is received deeply between the exoccipital and the petrosal in the *Pythonomorpha* in the same manner as in the *Tortricine* snakes, a structure which does not occur in the *Sauria*. This structure is somewhat

¹ In Tiedemann u. Treviranus, *Zeitschrift f. Physiologie*, IV, p. 233.

² *Proc. Am. Ass. Ad. Sci.*, XIX, 1871, p. 221; *Trans. Am. Phil. Soc.*, XIV, 1870, p. 29.

³ *Idem*; *The Cretaceous Vertebrata of the West*, Rept. U. S. Geol. Sur. Ter., II, 1875, p. 113.

⁴ *American Naturalist*, September, XXIX, 1895, p. 855.

masked in some genera of Pythonomorpha by the extension of the exoccipital over the paroccipital as a thin lamina on the posterior side; but its true relation to the petrosal can be seen on the anterior side. There can be no doubt that the Pythonomorpha form a line distinct from the Sauria, and that their resemblances to the Varani are the result of a parallel evolution rather than an indication of near affinity, as supposed by Cuvier.

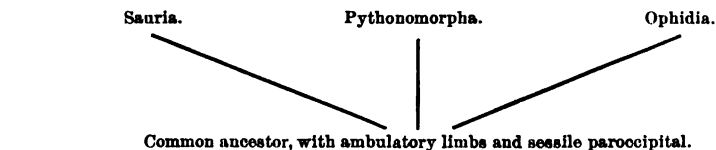
The failure of Cuvier, Owen, Dollo, Baur, and Marsh to perceive this fact is due to their want of information as to what the differences between the Ophidia and Sauria really are. Boulenger only has reached correct views on the subject, although not on account of the structure of the paroccipital, but on account of the character of the dentition and of the limbs.¹

The third character which I have pointed out as distinguishing the suborders of Squamata is the difference in the mode of articulation of the quadrate bone with the adjacent cranial elements. In the Sauria it articulates with the exoccipital, being also in contact with the paroccipital and the supratemporal. The contact with the paroccipital is insignificant, owing to the small size of that element; and that with the supratemporal is only important where that bone is well developed. In many Sauria it is feeble or wanting. In the Pythonomorpha and Ophidia on the other hand the quadrate articulates with the paroccipital, sometimes touching the supratemporal in the former. In some of the degraded Ophidia, as the Typhlopidae and Stenostomidae, the paroccipital is not distinct, so that the quadrate appears to rest on the exoccipital and the petrosal. It will, however, be necessary to subject these types to more searching investigation before it can be known that the paroccipital is absent.

As exceptions to the rule in the Sauria, Boulenger has pointed out that the quadrate does not reach the exoccipital in the Agamid genus *Chlamydosaurus*,² and I have found the same condition in *Phrynocephalus*.³

4. PHYLOGENY.

From this point of view the Ophidia and Pythonomorpha must be traced to some type in which the paroccipital bone is less remote from the brain case than is seen in the Sauria, where it has become a mere rudiment. Such a phylogeny would be expressed as follows. An investigation of the Dolichosauria of the Cretaceous might yield interesting results.



¹ Proc. Zool. Soc. London, 1891, p. 117.

² Ann. Mag. Nat. Hist., XVI, 1895, p. 367.

³ American Naturalist, 1896, XXX, p. 150.

This common ancestor is a land reptile with the peculiar character of the paroccipital seen in the Pythonomorpha. Whether it would enter this suborder remains to be ascertained. From it the Saurian type has been derived by the reduction of the paroccipital, and its wide removal from the cranial wall. The ophidian order has resulted from an enlargement of this element, together with its exclusion from the cranial walls, to which it nevertheless remains adherent. Boulenger¹ suggests that the Dolichosauria occupy this position.

The Squamata display among Reptilia tendencies which reach their extreme expression in the Ophidia. These are, as already pointed out, first, the disposition to reduction in the use of the limbs as supports of the body, and a consequent increasing tendency to rest the body on the ground when in motion; second, the increasing mobility of the suspensorium of the mandible, permitting an increase in the gape of the mouth, and the consequent capacity for swallowing large bodies. These tendencies are seen, first, in the successive shortening of the limbs and reduction in the number of the digits, and finally reduction and abolition of the limbs themselves. It is characteristic of the entire suborder that the ribs have only the tubercular articulation with the veterbræ, having lost the capitular, thus reducing the strength of the suspension of the viscera from the vertebral column. It thus becomes first comfortable, and finally necessary that the body should be supported by the earth or object on which the animal rests, the process being identical with that which has taken place in the Cetacea, which have also lost the capitular rib articulations after long suspension of the body in the water. This change is, of course, completed by the total loss of limbs, as is seen in many Sauria and in all Ophidia. The freedom of the distal extremity of the quadrate bone gives mobility to the mandible; but this function does not reach any great development in the Sauria, and is but little more obvious in the inferior Ophidia (Angiostomata). In the Ophidia generally it acquires an enormous development, most of all in the highest venomous forms (Solenoglypha).

5. HISTORY.

The order Squamata was first correctly delimited by Merrem in 1820,² who included in it only the Sauria and Ophidia. The name was proposed by Oppel³ in 1811, but he included in it the crocodiles. The character viewed by these authors as definitive was the possession of tegumentary scales, in contrast to the osseous carapace of the Testudinata. They were unacquainted with the various anatomical characters which distinguish the order from all others. The Sauria and Ophidia were regarded as orders by other authors, including Duméril, in accordance with the system of Brongniart (1799).

The first author to define the Squamata by anatomical characters

¹ Proceedings, Zoological Society of London, 1891, p. 118.

² Versuch eines Systems der Amphibien, Marburg.

³ Ordnungen Familien u. Gattungen der Reptilien, München.

was Latreille. In 1825, in his *Familles Naturelles du Règne Animal*, he separated the Squamata, under the name Squamosa, from the tortoises and crocodiles, on account of the slight fixity of the quadrate bone, the double male intromittent organs, and the structure of the feet. He was followed in this after a long interval by Stannius, who in 1856 reviewed the Squamata under the name of Streptostylia,¹ including in it the two orders Sauria and Ophidia. I adopted this name as that of a superorder in 1871,² including in it the Sauria and Ophidia, and a third order, the Pythonomorpha, which I had already proposed in 1869 for the mosasauroid reptiles. This arrangement was retained in a synopsis of the families of Vertebrata published in 1889,³ except that the term Squamata was employed instead of Streptostylia, and was applied to an order instead of a superorder. This arrangement is continued in the present work. Dr. Boulenger has adopted this system, but added the chameleons, or Rhiptoglossa, to the list of orders, increasing the number to four. This change is not adopted in the present work. The solidarity of the order Squamata is attested by the reproductive system as well as by the osseous, and especially by the characters of the male intromittent organ, as I have recently pointed out.

SAURIA.

I. ANATOMY.

1. OSTEOLOGY.

The following summary of the osteology of the Sauria is based on examinations of the specimens contained in most of the museums of Europe and of this country. For North American forms I am principally indebted to the United States National Museum, my private collection, and that of the Academy of Natural Sciences of Philadelphia. The characters observed during my study of material in Europe, which I found to be of the greatest taxonomic importance, I enumerated in a paper which is printed in the Proceedings of the Philadelphia Academy for 1864, p. 224. The use then made of those characters has been generally accepted by subsequent writers.⁴ There are, however, many other characters whose value is of uncertain taxonomic value, which were not then mentioned, and which I now record.

The first description of the osteology of the Sauria is that of Cuvier, which is contained in his *Ossements Fossiles*.⁵ This is an excellent one, but the many types discovered since his time render it neces-

¹ Siebold und Stannius, *Handbuch der Zootomie*, Berlin.

² Proceedings, American Association for the Advancement of Science, XIX, p. 233.

³ American Naturalist. See also Transactions, American Philosophical Society 1892, On the Osteology of the Skull of Reptilia.

⁴ See Boulenger, *Ann. Mag. Nat. Hist.*, XIV, 1884, p. 117; and Catalogue of Lizards in British Museum, I, 1885; II, 1885; III, 1887. This author has added osteological characters of the Eublepharidæ, Uroplatidæ, Pygopodidæ, and Dibamidæ.

⁵ Volume X, edition of 1836.

sary that a new survey of the subject should be made. In 1856 the *Zootomie der Amphibien*, by Stannius, appeared. The account of the osteology of lizards given in this work is more complete than that of Cuvier, but it is incomplete in many points, and is not up to the requirements of the present time. The present study is made with especial reference to the necessities of the paleontology of the order, therefore the description of characters is made as specific as possible. The principal novelty will be found in the references to North American genera and in the descriptions of the hyoid apparatus. The description of the scapular and pelvic arches in certain genera with the extremities degenerate or wanting, where they have not been previously described, is contained in a separate illustrated paper, which has been published.¹

Skull.—The premaxillary bone is single, except in the Scincidæ, Aconitiidæ, and some Geckonidæ (*Phyllurus* sp.). It is very small in the Iguanid genus *Phrynosoma*, and in the Agamidæ it is excluded from contact with the vomer by processes of the maxillaries, which meet on the middle line. In the Chamæleonidæ the premaxillary is still smaller, the body being narrower than the superior spine, and supporting but one tooth. In the Anguidæ the premaxillary is bounded posteriorly on each side by a foramen which is sometimes large, but is wanting in other families, including the Helodermidæ. In *Lepidosternum* it is principally on the inferior face of the muzzle. The nasal bones are generally distinct, but in the Varanidæ they are fused into a single narrow median element. In the Chamæleonidæ they do not attain the nasal border, being cut off by the junction of the prefrontal with the premaxillary and maxillary bones. In the genus *Feylinia* the nasal bones are fused into a broad plate. In *Lepidosternum* they are completely cut off from the nasal border by the maxillary, which is broadly in contact with the premaxillary spine. In *Rhineüra* the nasal bone reaches the nares, as in *Amphisbæna*. The frontal bones are separate in the Varanidæ, Helodermidæ, Anguidæ, Scincidæ, Anelytropsidæ, Anniellidæ, and Amphisbænidæ, and in some Geckonidæ. They are coossified in some Geckonidæ; in the Iguanidæ, Agamidæ, Xenosauridæ, Eublepharidæ, Chamæleonidæ, and Teiidæ. The parietals are generally fused, the only exception being the Geckonidæ, Uroplatidæ, and Xantusiidæ. Prefrontals are always present, and in Anniellidæ, Helodermidæ, and Chamæleonidæ they extend posteriorly to the postfrontals, excluding the frontal from the orbital border. Lachrymals are present, but they are fused with the prefrontal in the Scincidæ. The jugal is generally present, even when there is no postorbital arch, as in Geckonidæ, where it is a splint; but in the Amphisbænia, Annielloidea, and in *Feylinia*, the splint-like element attached to the maxillary extends to the pterygoid posteriorly and the prefrontal anteriorly, and may include the lachrymal. The jugal extends anteriorly as far as the lachrymal except in the Scincidæ. The postfrontal

¹ Journal of Morphology, VII, 1892, p. 223.

is wanting and in most cases is fused with the postorbital in the Varanidæ and Agamidæ; but in other families it is distinct, with sporadic cases of fusion, as in *Onemidophorus*. Superciliary bones are present in *Varanus*, *Phrynosoma*, and several genera of Agamidæ. They belong to the tegumentary system, and articulate the anterior with the prefrontal, the posterior (absent in *Varanus*) with the post-frontorbital bone. The supraoccipital is undivided and forms the superior part of the edge of the foramen magnum. Its anterior border is generally loosely articulated with the parietal, joining it by a rudimental or developed median gomphosis with the supraoccipital process. It is generally overhung by the parietal, always so when the parietoquadrate arches are present. It is entirely overroofed by the parietal in the Xantusiidæ, the two elements being connected by a vertical laminiform septum. It is not overhung in the Annielloidea and Amphisbænia, and in these the articulation is a firm complete transverse union. The parietoquadrate arch consists proximally of a process of the parietal, which is directed outward and posteriorly, which may represent the supramastoid element of the primitive Cotylosauria. Distally this process receives an ascending process of the paroccipital on its inferior aspect, sometimes anteriorly, sometimes posteriorly. This arch is shortened and depressed in the Anelytropidæ and is absent from the Anniellidæ and Amphisbænia. In the Chamæleonidæ it is differently composed, consisting of a superior posterior process of the supratemporal, which rises upward and reaches the produced apex of the undivided parietal. The supratemporal is accompanied for a short distance above the quadrate by the ascending process of the paroccipital. The pineal foramen is present in the Chamæleonidæ, Agamidæ, Iguanidæ, Anolidæ, Xenosauridæ, Anguidæ, Lacertidæ, Varanidæ, and Scincidæ. It is wanting in the Helodermidæ, Eublepharidæ, Teiidæ, Anniellidæ, and in the Amphisbænia. It perforates the parietal bone clear of all sutures in most of the families, but it is near to or on the frontoparietal suture in Iguanidæ and Anolidæ, and is in the frontal in *Dipsosaurus* and the Chamæleonidæ. The occipital condyle is compound, consisting of portions of the exoccipitals and basioccipital. In many genera these segments become so thoroughly coössified at maturity as to be undistinguishable. In some of the Geckonidæ (as *Gecko*, *Uroplates*) the occipital segment is so reduced as to give the appearance of two condyles. In the Amphisbænia the condyle is transverse and concave at the center, leaving the lateral portions prominent.

The postorbital bone when present sends a process posteriorly to the supratemporal, forming the supratemporal arch. In the genera without this arch the postorbital may be wanting, as in *Heloderma*, or be rudimental, as in *Anniella*. In the genera whose degeneration is advanced the supratemporal bone is appressed to the parietal, inclosing no foramen supratemporale, as in *Feylinia*. In limbless genera of Anguidæ

the supratemporal touches the parietal anterior to the paroccipital, thus reducing the supratemporal foramen. This occurs also in *Gerrhonotus*, *Celestus*, *Xenosaurus*, and *Xantusiidæ*. In *Heloderma* the supratemporal is a rudiment on the external side of the base of the paroccipital.

The remarkable upward production of the supratemporal in *Chamæleon* has been mentioned. Here this process takes the place of the parietoquadrate arch. The exoccipitals are produced laterally, each embracing, with the petrosal in front, the small paroccipital. This sustains the superior extremity of the quadrate. In the snake-like genera, as *Feylinia*, *Anniella*, and the *Amphisbænia*, this lateral elongation does not exist. The exoccipital is snake-like, and the quadrate is sessile on the side of the skull. The quadrate is generally convex at the upper part of its anterior face, and its external anterior border is produced outward so as to embrace a longitudinal concavity or conch, with the vertical mass or column of the bone. This column is itself more or less concave, its upper extremity being produced a little backward. In the *Iguanidæ* there is another concavity, internal to the column, similar to the external. This is much narrowed in the majority of the families, and in the *Varanidæ* and *Helodermidæ*, and in *Phrynosoma*, *Eublepharis*, and *Celestus* it is wanting. In *Chamæleon*, *Anniella*, and the *Amphisbænia* there is no external conch, the quadrate being simply a rod, while in *Feylinia* it is flattened in an anteroposterior plane. The mandibular articulation is more or less bilobate in all except *Varanus*, where it is plane. In *Gecko* the bilobation is strongly marked, as in the Permian *Theriodonta*. The pterygoid bones extend forward from the quadrates, with which they are in contact in all forms except *Chamæleon*, toward the middle line. This portion is generally grooved, but in *Xenosaurus* it is a slender rod. They are received on the basipterygoid processes of the sphenoid, and then diverge and assume a longitudinal position without meeting on the middle line. They are produced in an angle or process toward the posterior extremity of the maxillary bone, from which they are separated by the ectopterygoid. The pterygoids then join the palatines. In a few genera they bear a few small teeth. The palatines are separate from each other and from the maxillaries, but send a process outward and forward to the latter. They join in front each its corresponding half of the vomer. The internal nares are situated each between the vomer and the maxillary, and it notches more or less deeply the palatine, which forms its posterior border. The vomers are separate in all forms excepting *Chamæleon*, and they have various forms. In *Geckonidæ* and *Anolidæ* they are flat and fit closely together, and they have the same character in many *Agamidæ* and *Iguanidæ*. In a few members of these families (*Uromastix* and *Sauromalus*) they are divided by a groove, which becomes a fissure posteriorly, which is the character in most other lizards. In the *Varanidæ* each vomer is produced posteriorly on each side this fissure to a greater distance than in other forms. The planes of the palate differ much in different families and groups. Thus, the vomer

is on a much higher plane than the palatines in *Chamæleonidæ* and *Geckonidæ*, the palatines curving downward to meet the pterygoids. The latter are generally horizontal, but in *Chamæleon* they are in a sub-vertical plane, their free rounded extremities descending and fitting on the inner side of the mandible. They do not quite reach the quadrate. In the *Agamidæ*, *Iguanidæ*, and *Geckonidæ* the internal extremity of the ectopterygoid is directed inferiorly, forming a downwardly directed angle on each side of the palate. In the *Amphisbænia* the structure of the palate is much more compact than in other lizards. The palatines are in contact on the middle line and there is no palatamaxillary foramen. That is, the palatine is in close contact with the maxillary, the ectopterygoid being tightly wedged in between them. The pterygoids are in contact throughout their length with the sphenoid, and the proximal end of each is tightly wedged between the latter and the quadrate.

The character of the petrosal must be attended to by anyone who desires to understand the relations of the *Sauria* among themselves. In no member of the *Sauria* is the trigeminus foramen closed anteriorly by bony tissue, but it is inclosed by the membrane which forms the anterior wall of the brain case. The petrosal is divided into two parts by the deep notch whose fundus forms the posterior border of this foramen, which may be called the supra and infra foramina portions. The infraforamina portion is divided in most of the families by a longitudinal, keel-like ridge, which forms the superior border of a groove whose inferior wall is formed by the sphenoid. This groove is not present in *Heloderma* and is very shallow in *Xenosaurus*. It is wanting in the *Anniellidæ* and *Amphisbænia*. In the *Geckonidæ* it does not exist, nor is the petrosal notched by the foramen, while the anterior border of the petrosal forms a free crest which extends from above downward and backward. In the *Chamæleonidæ*, *Agamidæ*, *Iguanidæ*, and *Anolidæ* (families with papillose tongues) the supraforamina part of the petrosal is short and is bounded by a convex anterior border which marks the position of the anterior semicircular canal. In the *Nyctisaura*, *Thecaglossa*, *Diploglossa*, *Leptoglossa*, and *Amphisbænia* (families with smooth or squamous tongues, except *Anniella*, *Diploglossa*, and *Nyctisaura*) the petrosal is produced beyond this curved border below the parietal. In many forms an outline of the semicircular canal which forms the boundary in the other superfamilies may be traced, whence I have termed this part of the petrosal posterior to it "the arched body" in my former system of the *Sauria*.¹ The petrosal is produced farthest beyond this arcade in the snakelike forms of the *Anniella* and *Amphisbænia*, reaching almost to the orbit in *Lepidosternum*. The relation to the parietal differs, the differences resulting from the greater or less reduction of the primitive supratemporal roof and the greater or less entrance of the parietal into the lateral wall of the brain case. In most of the families it is little or not decurved to

¹Proceedings, Academy of Natural Sciences, Philadelphia, 1864, p. 224.

meet the petrosal; and in the Iguania, where it is decurved, it does not come in contact with the petrosal, owing to the shortness of the latter. In certain families where the petrosal is produced beyond the arcade, and the parietal is decurved, the two elements are in contact for a short distance, as in the Varanidæ. In the Teiidæ and Scincidæ the contact is mainly effected by a short descending process of the parietal. This process is especially elongate in the Scincidæ. The arcade is the anterior border of the petrosal in the Permian Theriodonta, and it marks the position of the anterior semicircular canal. The membranous wall of the brain case, anterior to the petrosal, contains an ossification which is of uncertain homology. It reaches or approaches by its superior extremity the frontal, and might hence be supposed to be the orbitosphenoid; but this homology is vitiated by the fact that its inferior portion passes behind the optic foramen. The latter position is that of the alisphenoid, and so the bone is named by Parker¹. But there is another element, the epipterygoid, posterior to it and immediately anterior to the petrosal, which has been supposed to be the true alisphenoid.

Leaving this question, and adopting for the bone in question the provisional name of postoptic, I remark that it is typically triradiate, sending two branches upward and one downward. This is its character in Agamidæ, Varanidæ, and Teiidæ. The posterior superior branch is much reduced in many Iguanidæ and Lacertidæ and in some Agamidæ (*Megalochilus*), and it is absolutely wanting in *Gerrhosaurus* and *Chamæleon*. There is no postoptic in *Heloderma*. In the Rhynchocephalian genus *Sphenodon* these two elements coexist with an orbitosphenoid, lying between the optic and trigeminal foramina. The two together may be homologous with the mammalian alisphenoid. The epipterygoid is present in all Lacertilia excepting the Chamæleonidæ and Annulati (Amphisbænia). Its superior connections are quite characteristic of the different families. Inferiorly it rests on the pterygoid posterior to its ectopterygoid process, excepting in the Geckonidæ, where its point of attachment is opposite to that process. In the same family it does not reach the parietal, but the superior extremity rests on the apex of the supraforaminal part of the petrosal. In the remaining families there are three modes of superior attachment. In most of the Iguania and Acrodonta it reaches the parietal and does not touch the short petrosal. In the other superfamilies it is in contact with the petrosal. In the Varanidæ, Helodermidæ, and most Anguidæ it reaches the parietal, which does not meet it with a conspicuous descending process. In Scincidæ and Teiidæ a conspicuous descending process meets it. In a certain number of genera of various families it does not quite reach the parietal. Such are Eublepharidæ, Gerrhosauridæ, *Anguis*, *Lacerta*, *Phrynosoma* (where it rests on the arcade of the

¹Transactions Royal Society, 1879, p. 605, on the Development of the Skull in Lacertilia.

petrosal), *Iguana*, *Uromastix*, *Agama*, and *Gonyocephalus (subcristatus)*. In *Lyriocephalus* and *Phrynocephalus* the epipterygoid is very short.

The semicircular canals perforate the supraoccipital, the exoccipital, and the petrosal. The internal is in a subtransverse vertical plane, causing a convexity on the internal side of the supra- and exoccipitals, and in some types a visible rib on the superoexternal surface of the same. The external canal is in a horizontal plane and perforates the base of the exoccipitopetrosal suspensorium, causing a horizontal rib on the anterior face of the latter in some forms. The anterior is in a vertical anteroposterior plane, and perforates principally the petrosal, occupying its anterior border, which forms the "arcade" in most of the thick-tongued superorders, but crossing the bone much behind the anterior border in the slender-tongued superorders and the *Diploglossa*. The fenestra ovalis is tightly closed by the disk of the stapes, which is continued externally as the rodlike columella. This rod is slender except in *Anniella*, where it is remarkably robust. In the other *Amphisbænia* its tympanic extremity is somewhat thickened. The columella is continued externally into a cartilage, which is more or less expanded in the vertico-transverse plane, the distal portion always so, forming a vertical lamina in contact with the tympanic membrane. This is the epistapedial cartilage. It is frequently produced upward beyond its point of attachment into a suprastapedial process. The plate thus formed is almost separate from the proximal axial part of the cartilage in *Heloderma*.¹ The axial portion has a descending process, the infra-stapedial of Parker, in *Lacerta*, *Heloderma*, but not in *Eublepharis*, *Thecadactylus*, and *Phyllodactylus*.

The rami of the lower jaw are united at the symphysis by ligament only. The angle is a prolongation of the articular bone; it is elongate and simple, except in *Anniella* and *Chamæleon*, where it is absent. The angular bone never reaches the angle, and has an anterior position, being sometimes fused with the articular. The relations of the segments of the lower jaw are very characteristic in the divisions of the Sauria. The splenial bone is wanting in the *Chamæleonidæ*, and is very small in the *Agamidæ*; in other families it is well developed. The dentary extends posteriorly on the external face of the ramus, as the splenial diminishes, having the greatest posterior extent in the two families mentioned. The coronoid is differently extended in a similar ratio. Thus it is extended posteriorly on the external side of the ramus, and not anteriorly, in the *Chamæleonidæ* and *Agamidæ*; both forward and backward in the *Geckonidæ*; and forward in the other families. The angular is absent (fused with the articular, Boulenger) in the *Geckonidæ*, *Anolidæ*, *Acontiidæ*, *Anelytropidæ*, *Annielidæ*, and the *Annulata*, and is distinct in all other families. The articular and surangular are fused in several genera of *Iguanidæ*; and there are but three bones in the ramus of *Xantusia*, which see. The

¹ Memoirs, National Academy of Sciences, III, 1884.

angular extends well anteriorly on the interior border of the jaw in this order, but is differently developed on the inner and outer faces. The Chamæleonidæ and Agamidæ again show their similarity in having this element chiefly exposed on the interior side, while in other types the exposure is external. The Meckelian groove is open in the Chamæleonidæ, Agamidæ, and Varanidæ, but is roofed over more or less completely in all other families.

The hyoid system is not connected with the skull except in Geckonidæ, Eublepharidæ, and *Lepidophyma*, so far as I have examined them. Thus in *Thecadactylus*, *Phyllodactylus*, and *Eublepharis* the ceratohyal is continuous with a cartilage which projects from the paroccipital above the posterior part of the auditory meatus. In *Lepidophyma* the free epibranchial is attached to the inferior lateral angle of the basioccipital. In forty-two genera of other families enumerated below this is not the case. In no genus have I discovered any connection with the stapedial cartilages. The hyoid system in lizards consists of a glossohyal which is continuous with a basihyal tract, a hypohyal often continuous with the basihyal tract, a ceratohyal, a first ceratobranchial, and a second ceratobranchial which is always continuous with the basihyal tract. There may be in addition an epibranchial, which belongs to the first ceratobranchial. In some genera there is a free epibranchial, which may be then closely approximated to the ceratohyal (*Eumeces*, *Oligosoma*, *Gerrhonotus*), or to the second ceratobranchial (*Lacerta*, *Xantusia*, *Lepidophyma*). The only constantly ossified element is the first ceratobranchial. The genera and families differ in the presence or absence of the second ceratobranchials and epibranchials, and the proximity or separation of the former. In general the Varanidæ, Anguidæ, Zonuridæ, Gerrhosauridæ, Scincidæ, Lacertidæ, and Xantusiidæ have epibranchials, while the thick-tongued and most degraded types are without them. In the Teiidæ the hypobranchials are much produced anteriorly beyond the bases of the ceratohyals, and there are no second ceratobranchials. In Anguidæ the hypobranchials are also greatly produced forward, but carry the ceratohyals with them. Ceratobranchials of the second pair are also wanting in Varanidæ, Helodermidæ, Chamæleonidæ, Anguidæ, Anniellidæ, and *Rhineura*; *Phyllodactylus*, *Thecadactylus*, and *Gecko*, among Geckoniæ; and *Egernia*, and *Gongylus* in Scincidæ. Ceratohyals are wanting in *Chamæleon*, *Anguis*, *Anniella*, and *Annulata* generally. In both Agamidæ and Iguanidæ the second ceratobranchials are separated from each other in the depressed genera of terrestrial habits, and in close contact with each other in those of arboreal habits; but they are in close contact in *Callisaurus* and *Crotaphytus*, both terrestrial genera. In *Calotes*, *Iguana*, and *Anolis* they act as the rim on which the gular pouch or fan is stretched. The characters of Saurian hyoids may be tabulated as follows: Most of the genera referred to are figured in Plates III to VI.

I. Ceratohyal present.

II. Ceratohyal absent.

A. A second ceratobranchial.

a. Free epibranchials present.

Scincidæ.
 Lacertidæ.
 Xantusiidæ.

aa. No free epibranchials.

(Scincidæ) *Mabuia agilis*; *Gongylus ocellatus*.

Anolidæ.

Iguanidæ.

Agamidæ.

Zonuridæ.

Eublepharidæ.

(Geckonidæ) *Aristelliger*.

Chirotidæ.

Amphisbænidæ.

AA. No second ceratobranchial.

a. No free epibranchials.

Geckonidæ.
 Varanidæ.
 Helodermidæ.

Rhincœra.

Chamæleonidæ.

Teiidæ.

Gerrhosauridæ.

Anguidæ.

Anguis.

Anniellidæ.

Vertebral column.—Except in the families of the Geckonidæ and Uroplatidæ, the vertebral centra are procœlous. In the families named they are amphiœlous. The zygosphen articulation is present in the Teiidæ and the larger Iguanidæ, including a rudiment in *Crotaphytus*. In smaller Iguanidæ (*Sceloporus*, *Phrynosoma*) and in Sauria generally this kind of articulation is wanting. In a good many families the caudal vertebræ are divided by a transverse fissure or suture in front of the middle, which often splits the base and sometimes the length of the diapophysis. Such a structure is seen in Iguanidæ (*Iguana*, *Sauromalus*, *Sceloporus*, *Dipsosaurus*), Anolidæ, Anguidæ (*Celestus*), Teiidæ (*Tupinambis*, *Onemidophorus*), Lacertidæ (*Lacerta*), and Scincidæ (*Gongylus*, *Eumeces*). In *Dipsosaurus*, *Anolis*, and *Lacerta* the neural spines of the caudal vertebræ are double; in the other genera named, single. In Varanidæ, Helodermidæ, *Gerrhonotus*, *Crotaphytus*, and *Phrynosoma*, the caudal centra are undivided, and the neural spines are single. In *Ophisaurus* the centra are undivided and the neural spines double. The centra are excessively thin in *Ophisaurus*, so that they break more readily than they disarticulate. There are two sacral vertebræ except in genera with the posterior limbs rudimental or absent. In some of these, however, especially the degenerate genera of the Anguidæ, the rudimental ilium is attached to two diapophyses which join each other distally.

Intercentra are present in the cervical and caudal regions in the latter, supporting the chevron bones. Besides the intercentra there

are inferior processes of the cervical centra in some forms, the hypapophyses of Owen. These have been confused with the intercentra by Boulenger, and have been renamed catapophyses by Baur.¹

The first dorsal vertebra is that one which is first connected with the sternum by a hæmapophysis. In genera with a well-developed sternum the number of vertebræ anterior to the first dorsal is eight, except in the *Varanus niloticus* (Ouvier) and *V. griseus*, where it is nine. In the extinct Dolichosauria of the Cretaceous period the cervical vertebræ are stated by Owen to number seventeen.

The number of ribs attached to the sternum diminishes with the reduction of the limbs, from the normal of four on each side to one, and total disconnection. A common hæmapophysis or "xiphoid rod" succeeds these on each side, which gives attachment to two separate hæmapophyses for ribs. The common hæmapophysis is a segmentation of the anterior part of the fifth hæmapophysis, and it is not distinct in some genera, as, *Sauromalus*. In *Heloderma* the fifth hæmapophysis has no sternal segment or connection, and the sixth is wanting. In *Varanus* the fourth, fifth, and sixth are wanting. In genera with the two appendicular hæmapophyses they are closely appressed on the middle line in the majority of the genera, but in genera of depressed form they are separated, often widely. They are separated in *Stenodactylus guttatus*, in *Phymaturus*, *Crotaphytus*, and *Sceloporus*. They are more widely separated in *Dipsosaurus*, and most widely in *Sauromalus* and *Phrynosoma*. Cervical ribs are present in varying numbers, and the posterior ones are generally quite elongate. In certain genera and families the ribs posterior to those attached to the sternum have their hæmapophyses fused on the middle line below, thus constituting a series of abdominal ribs. In the Iguanid genus *Scartiscus* there are two such ribs. In the Anolidæ there are four and five pairs; in the Polychroine Iguanidæ there are seven to ten. In the Chamæleonidæ and Geckonidæ there are several pairs. The ribs of *Lepidosternum* are remarkable for the presence of a capitular process which has no distinct capitular articulation.

Scapular arch.—The clavicle is present in all the families except the Chamæleonidæ, and in certain genera with degenerate fore limbs. In such genera it is the last portion of the scapular arch to remain, and it is the only element present in *Feylinia* (Anelytropsidæ). It is always osseous. The form of its proximal extremity varies in the different families. It is simple in the Nyctisauræ, Uroplatoidea, Acrodonta, Iguania, Diploglossa, and Thecaglossa, and expanded and generally perforate in the other superfamilies where present, except in some degenerate genera where it is simple (see Plate II, fig. 2). In *Trachysaurus* and *Cophias* its proximal end is dilated, but not perforate. The scapula varies in form from elongate to short and wide. It presents a

¹Proceedings, U. S. National Museum, XVII, 1894, p. 351.

proscapular process in many families and genera. It is present in *Iguania* and *Nyctisaura*, in the last named often decurved and acuminate, and in *Lophura*, in *Acrodonta*. It is present among *Leptoglossa* in *Cnemidophorus*, and in some *Ameivæ*, while in other *Ameivæ* it is wanting. It is wanting generally in *Acrodonta*, *Diploglossa*, *Thecaglossa*, and *Leptoglossa*, but it is present in *Celestus striatus*. It is wanting in *Rhaptoglossa*. The coracoid is extended anteriorly to the sternum, and it is generally deeply emarginate on its anterior interior border. These emarginations are closed by the procoracoid, which extends to the middle line, and is only partially or not at all ossified. There are two coracoid emarginations in most *Iguania*, exceptions being the terrestrial genera *Urocentrum*, *Sceloporus*, and *Phrynosoma*, and the *Anolidæ*. There are also two in *Varanidæ* and *Teiidæ*. The *Agamidæ* generally have but one, but *Uromastix* is an exception. There is but one in *Anguidæ* and *Scincidæ* (two in *Tiliqua*), and none in *Helodermidæ* and *Chamæleonidæ*.

The interclavicle is a very characteristic element in the *Sauria*. It is wanting in *Chamæleonidæ* and in some genera with fore limbs rudimental or absent. It is a simple splint in *Helodermidæ* and some degenerate genera. In other families it has a transverse limb on each side, which may be anterior, producing the "anchor-shaped" form, or median, producing the "cruciform" type. It is anchor shaped in *Acrodonta*, *Iguania*, and *Thecaglossa*, and cruciform in *Diploglossa* and *Leptoglossa*. In *Nyctisaura* it is cruciform, with the lateral processes wide at the base. The sternum is a broad subrhombic plate which articulates by its anterolateral borders with the precoracoid and coracoid, and by its posterolateral borders with the ribs. In genera with well-developed limbs its principal differences are seen in the nature of its fontanelles when present. In the *Agamidæ* there are two, and in most *Iguanidæ* there is one. Exceptions are the genera *Polychrus*, *Sauromalus*, and *Dipsosaurus*, where there is no fontanelle. There is none in the *Anolidæ*. In *Teiidæ* and *Lacertidæ* it is present, but in *Scincidæ* it is mostly absent, exceptions being the North American species of *Eumeces*. The fontanelle is wanting in *Geckonidæ*, *Diploglossa*, *Helodermatoidea*, *Thecaglossa*, and *Leptoglossa*, with the exceptions above noted. The single median fontanelle is frequently concealed by the median limb of the interclavicle. It is nearly divided in some species of *Sceloporus*.

The pelvic arch.—It is characteristic of the *Sauria* that the ilium is directed upward and posteriorly, and that the obturator foramina are well developed. The latter are only separated from each other by ligament or cartilage, which may sometimes contain some lime salt. It is produced posterior to the ischia in a triangular process, and less frequently into a similar one in front of the pubic symphysis. The pubic foramen is always present. The pectineal process is present

except in Geckonidæ, but it is rudimental in some forms, as *Phrynosoma*. The following table shows the forms of the pubis in twenty-three genera of different families:

I. Pubes uniting at an acute angle.

- | | |
|--|---|
| 1. Pectineal process anterior | <i>Chamæleon</i> . |
| 2. Pectineal process median | <i>Calotes</i> , <i>Draco</i> ,
<i>Iguana</i> , <i>Dipsosaurus</i> , <i>Anolis</i> ,
<i>Gerrhonotus</i> ,
<i>Tupinambis</i> , <i>Cnemidophorus</i> . |
| 3. Pectineal process near acetabulum | <i>Scincus</i> ,
<i>Lacerta</i> ,
<i>Eumeces</i> (rudimental). |
| 4. No pectineal process | <i>Gonyocephalus</i> . |

II. Pubes uniting at an obtuse or very open angle.

- | | |
|--|---|
| 1. Pectineal process median | <i>Iguana</i> , <i>Cyclura</i> , <i>Crotaphytus</i> ,
<i>Histiurus</i> . |
| 2. Pectineal process near acetabulum | <i>Agama</i> ,
<i>Phrynosoma</i> , <i>Sauromalus</i> , <i>Scoloporus</i> ,
<i>Heloderma</i> ,
<i>Varanus</i> . |
| 3. Pectineal process none | <i>Gecko</i> (<i>Phrynosoma</i> , rudiment). |

There is a tuber ischii in all of the genera which have come under my observation except *Varanus*. In *Heloderma* and some other forms it is small.

The anterior limb.—The humerus is much alike in all Sauria, *Chamæleon* only presenting peculiarities. The proximal end is expanded nearly in one plane, and the middle portion of the flattened extremity forms the oval head. This is not distinctly isolated, except by the presence of articular surface, from the greater and lesser tuberosities which occupy the angles of the expansion. The shaft betrays no twist. The distal end is chiefly occupied by the condyles; but there are epicondyles, of which the internal is the more prominent, except in *Chamæleon*, where they are wanting. The condyles consist of an external rib and a medio-internal roller, which is generally bounded at the internal extremity by a tuberosity, which is, however, wanting in *Chamæleon*. The ulna articulates with the median roller, its external edge being beveled by the external rib. The head of the radius articulates with the external rib, having shifted from its primitive position on the inner side. It results from this that in pronation the radius crosses the ulna. There is a short olecranon, except in *Chamæleon*. The ulna and radius have about an equal share in the carpal articulation, sometimes the ulna a little the greater.

The constitution of the carpus is very uniform in Sauria, with developed anterior limbs, the principal diversity being displayed by the *Chamæleonidæ*. In all, we have in the proximal row three distinct elements—the radiale, intermedium, and ulnare (= pisiforme), the latter mainly external to the ulna and directed posteriorly. Distal to the radiale and intermedium, and between them and the carpalia of the

second row, is a single small centrale. There are five carpalia, each corresponding to a metacarpal. I have failed to find in any of the genera at my disposal any of the carpalia fused together or wanting. In *Chamæleon*, on the contrary, Cuvier has shown that there is no ulnare, and that the centrale and carpalia are fused into a single round median piece, to which the metacarpals are articulated. In all the normal Sauria the tendons of the flexors of the digits are combined on the palm, and the point of junction is occupied by a large flat sesamoid bone. The number of phalanges is also remarkably uniform. They number in each digit, commencing with the pollex, 2-3-4-5-3. The sole exception in the genera with well-developed extremities is *Chamæleon*, where the numbers are 2-3-4-4-3. This genus differs also from other forms in the shapes of the metacarpals. Normally they are cylindric and subparallel in position and united in a common integument; but in *Chamæleon* they are flattened, with expanded extremities, and divided into two bundles by a fissure, three within and two without, enabling the three inner digits to oppose the two outer round a branch of a tree. The number of digits in Sauria is normally 5-5, but reductions take place presenting variations from 4-5 to 1-1, the posterior limb usually displaying a lesser degree of degeneracy than the anterior, although not always.

Posterior limb.—The femur differs from the humerus in having a distinct head, which is marked off from a trochanter. The former is not hemispherical as in Mammalia, but is somewhat compressed, and is oval in section. The trochanter is on the inferior anterior side of the head, or in the position of the little trochanter of the mammalian femur. There is no great trochanter nor third trochanter. The condyles of the femur are not as well defined as in the Mammalia, and the patellar groove is represented by a shallow concavity without lateral ridges. Patella none, with some exceptional rudiments, as, for example, in *Varanus*. In *Chamæleon* all the prominent features of the femur are toned down, the trochanter being represented by a ridge. The fibula is more slender than the tibia, and is larger distally than proximally, the reverse of what obtains in the tibia. The latter has no crest.

Like the carpus, the tarsus is very uniform in the Sauria, the sole important modification being exhibited by the Chamæleonidæ. There are two fused proximal elements, which are probably tibiale-intermedium and fibulare. They are only distinct in *Heloderma* among North American genera, but a trace of the suture is seen in *Varanus*. In most Sauria there is then but one bone of the proximal row, which is flat and wider than long. No centrale, and but two tarsalia, the third and fourth, the latter much the larger. The second metatarsal projects alongside of t. iii, so as to approximate the tibiale; its head is figured by Cuvier as a distinct bone, but he does not describe it as such. In *Chamæleon* there is a single proximal tarsal element, which is not flattened as in other lizards, and this articulates with a single subglobular

tarsale, from which the metatarsals radiate.¹ The phalanges number, like those of the anterior foot, 2-3-4-5-3, in ordinary Sauria, and 2-3-4-4-3 in Chamæleonidæ.

2. DIGESTIVE SYSTEM.

The alimentary canal in the Sauria is not very highly specialized into distinct regions. There can always be distinguished stomach and small and large intestines, the former by its muscular walls and the intestines by their respectively different diameters. The stomach is always simple, and is curved to the right at the pylorus, though in some of the serpentiform genera the curve is very slight. The small intestine forms a sigmoid which forms a loop cephalad just distad of the liver. This sigmoid is rarely simple, but is generally plicated, frequently highly so. The large intestine may or may not be distinguished into colon and rectum. The latter is constricted off at its extremity from a cloaca, which has common orifice with a short common genital chamber immediately above it, into which enter the oviducts, usually at the extremity of two papillæ.

The liver is not subdivided except at its distal border. Its form differs in the different superfamilies and families, and it is more elongate and originates further posterior to the heart in the serpentiform genera in each. The gall-bladder is always situated at or within its posterior border, and not at a distance from it. Spleen and pancreas present.

3. CIRCULATORY SYSTEM.

The heart is not situated far posteriorly in any form, not even in the serpentiform. There is sometimes a second anterior aorta bow in front of the usual aorta root. A *carotis communis* issuing from the right aorta root. Anterior abdominal vein joining the *renalis revehens* near the posterior border of the liver, and forming with the portal vein the posterior cava. This vein passes through the liver, receiving numerous hepatic veins. Two anterior cardinals (jugulars) enter the sinus venosus with the posterior cava.

4. RESPIRATORY SYSTEM.

The Sauria have two lungs, excepting the Annulati, which have but one. These are situated behind and on each side of the alimentary canal opposite to that portion which immediately follows the heart, excepting in the Annulati, where the lung lies ventrad of the alimentary canal for part of its length at least. Trachea with or without

¹ Cuvier (*Ossements Fossiles*, ed. 1836, p. 98) describes a distinct tibiale and fibulare in *Chamæleon*, and figures them (pl. 245, fig. 52). These are not represented by Boulenger (*Proc. Zool. Soc.*, London, 1891, p. 118). They are, in fact, not distinct tarsal elements, but are the epiphyses of the tibia and fibula, such as exist also in *Heloderma* and other genera. The tibiale and fibulare are fused into a single element as in other Saurians.

bronchi, which, when present, are usually very short, but are elongate in the *Thecaglossa*. Laryngeal cartilages only specialized as to the terminal one which forms a pair of shell-like arytenoids, which bound the *rima glottidis*.

5. UROGENITAL SYSTEM.

Testes single, situate well anterior to the cloaca. Ovaries occupying a corresponding position. Oviducts transversely plicate when empty, with nonplicate borders, and with fontanelle a little anterior to position of ovaries; orifice into vagina small; vasa deferentia convolute, adherent to kidneys. Kidneys posterior, symmetrical; ureters short. Urinary bladder generally present, but rudimental in some and absent in a few forms, as, for instance, the *Teiidae*.

The male intromittent organ or hemipenis presents much variety of structure, showing some parallels to the corresponding part in the snakes. It is, however, rarely spinous, as is so generally the case in the *Ophidia*, the only spinous form being, so far as I have examined, the American *Diploglossinae* and genera allied to *Cophias*. The higher *Sauria* have the apical parts modified as in the *Ophidia* by the presence of calyculi. Such are characteristic of the *Rhiptoglossa* and *Pachyglossa*. The *Nyctisaura* possess the same feature. The *Diploglossa*, *Helodermatoidea*, and *Thecaglossa* have the organ fionced, the fionces often pocketed or repand on the margin. In the *Leptoglossa* we have laminae only; in the *Teiidae* mostly transverse, and in the *Scincidae* mostly longitudinal. In various genera terminal papillae are present. The organ may be simple or bifurcate, or merely bilobate. I have not met with the case so common in *Ophidia* where the sulcus spermaticus is bifurcate and the organ undivided.

The structures of the hemipenis have a constant systematic value. As in the *Ophidia*, the value differs with the character, but it varies from generic to superfamily.

6. TEGUMENTARY SYSTEM.

This includes the dermal, the mucous, and the serous structures. I give attention to the serous or peritoneal membrane, which presents a considerable variety of structure among the *Sauria*.

A fold suspends the alimentary canal from the median dorsal line forming the dorsal mesentery. No other mesenteries bind the canal, except the stomach, and sometimes an adjacent portion of the small intestines, which have other connections. The liver, on the other hand, has several mesenteric connections, as follows: Its ventral face has usually a single sheet connecting it with the median ventral line, but in rare instances it is bifurcate posteriorly (*Trachysaurus*), or even double (*Tiliqua*). This sheet, or one of them, is continued along to the anterior abdominal artery to the ventral wall, and sometimes along the gall duct to the pyloric part of the small intestine. Each border of the liver is concave above, in adaptation to the lungs, in the types where they extend so far posteriorly, which is the usual arrangement. The median portion of the liver is concave above, usually in adaptation to the stomach. From the left-hand ridge thus produced a sheet or mesentery extends to the stomach, forming the gastrohepatic mesentery. From the right-hand superior angle a mesentery extends to the right dorsal body wall, forming the right hepatic

mesentery. The three mesenteries now described are the only ones which are universally present which bind the liver. The following sheets are present in various types: Generally the right hepatic and the gastrohepatic give off sheets to the right and left lungs respectively, constituting the right hepatopulmonary and gastropulmonary mesenteries. A sheet occasionally goes off from the gastrohepatic to the left body wall, forming the left gastro-parietal mesentery. This is frequently represented by a narrow band, and occasionally, as in *Dipsosaurus*, it joins the small intestine just beyond the extremity of the gastrohepatic sheet. This is not represented on the accompanying diagram. In *Heloderma* a distinct sheet extends from the left border of the liver to the left body wall, forming the left lateral hepatic mesentery. In *Polychrus* and *Anolis* the left lung, instead of being attached to the gastrohepatic mesentery, is attached by a sheet to the left border of the liver, forming the left hepatopulmonary mesentery. In *Varanus salvator* there is a short median gastrohepatic sheet. In *Varanus*, owing to the anterior position of the lungs, they have no hepatic or gastric connections. In no Saurian have I observed a right hepatopulmonary sheet, as the right hepatic mesentery takes in the right lung in its course. The latter extends along the apical strip of the right lobe of the liver

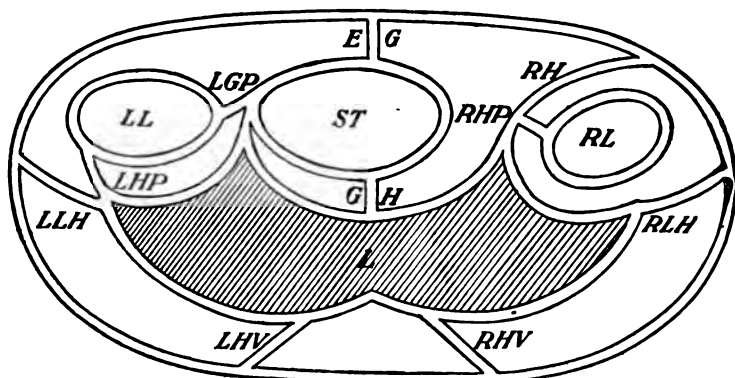


Fig. 5.

DIAGRAM OF PERITONEUM OF SAURIA, WITH ALL THE FOLDS DISPLAYED BY A TRANSVERSE SECTION NEAR THE MIDDLE OF THE LIVER.

L, liver; *ST*, stomach; *RL*, right lung; *LL*, left lung; *EG*, epigastric peritoneal fold; *LHV* and *RHV*, left and right hepatoventral folds; *RLH* and *LLH*, right and left lateral hepatic folds; *RH*, right hepatic; *GH*, gastrohepatic; *LHP* and *RHP*, left and right hepatopulmonary folds.

to the genital mesentery in many genera. In *Tupinambis*, *Dracæna*, and some others the right hepatic extends as a strong sheet to the right body wall, forming, with an equally strong gastroparietal of the left side, a kind of diaphragm. In many genera the right hepatic sheet is connected with the stomach, especially at its proximal part.

Besides the hepatic and gastric mesenteries, there are those which inclose the internal genitalia, the urinary bladder, and the corpora adiposa. The genital mesentery is sometimes quite extensively free, and is always so anteriorly, especially where it supports the wide fontanelle of the oviduct. There is no mesentery of the corpora adiposa, and a pouch only in those cases where those bodies project freely into the abdominal cavity, as is frequently the case. The cystic mesentery is a transverse fold of the peritoneum which lines the inferior wall of the pelvic cavity, and which incloses the urinary bladder when it is present.

The integument of the Sauria is divided into scales of a great variety of structure. Some of them are ossified, and in such cases are traversed by canals (Scincidæ). Others are produced into acute apices, which are ensheathed by a very hard epidermis, which becomes formi-

dable as a horny weapon. On the posterior part of the inferior face of the thigh in many genera the scales of one or rarely two rows are deeply fossate, and the fossæ are occupied by a waxy plug, which projects beyond the general level. The use of this substance is uncertain, but it is probably an important aid to the animal in maintaining its hold on smooth surfaces. Lizards which move on the ground rest much on the thighs, which are not elevated above the ground in many types, but serve as the principal point of contact from which they make their leaps. The same is true of some genera which leap among trees from branches and trunks. A similar secretion issues from the preanal scales in some Iguanidæ (*Liolaemus*, etc.), and in an African Lacertid a rudimental structure of this character is found on many of the abdominal scales (*Poroidogaster*). An approximation to this structure I have seen on the preanal scales of an adult male of *Sceloporus horridus* of Mexico. Here the epidermis is greatly thickened above the middle posterior part of the scale, so much so as to make a deep impression in the true skin, simulating a true preanal "pore." I suspect that the nature of these structures is similar to that of corns in higher Vertebrata.

When the tails of lizards are fractured a cartilaginous rod is developed from the centrum of the last vertebra remaining, on which muscles and integument appear. The scales are not similar to those of the normal tail, but resemble generally those of snakes, having a rhombic shape. Sometimes, as in various Scincidæ and Geckonidæ, a series of transverse plates is developed on the under side, which does not exist in the normal tail. According to Boulenger the new scales in Lacertidæ, Gerrhosauridæ, and scinc-like Anguidæ reproduce scales of the normal type. This author shows that in the Teiid genus *Gymnophthalmus*, which has scincoid scales, the reproduced scales of the new tail resemble those of the chalcidiform Teiidæ, which are totally different. In *Dopasia*, which has Gerrhonotid scales, those of the reproduced tail are scincoid.¹

Lizards which live in sandy deserts sometimes have the lateral scales of the digits produced into spines. These probably aid in securing a good foothold in the unstable surface. Such a structure appears in the Geckonid genus *Ptenopus*, of South Africa, in the Agamid genus *Phrynocephalus*, in Asia, and in the Iguanid genus *Uma*, in North America. This is an interesting example of homoplasy.²

7. NERVOUS SYSTEM.

The brain of Sauria may be distinguished as to external form from that of the Ophidia by the less posterior expansion of the prosencephalon, the hemispheres having about the same width posteriorly as the mesencephalon. In the Ophidia the hemispheres spread laterally behind so as to be wider than the mesencephalon. The rhinencephalon

¹ Boulenger, Proceedings, Zoological Society of London, 1888, p. 351.

² Cope, American Naturalist, XXVIII, 1894, p. 435.

is generally much more elongate than in the Ophidia, each consisting of a slender peduncle and distal hollow bulb. In the genus *Gongylus*, and probably in other Scincidæ, the olfactory process is not longer than in the Ophidia. The ventricles of the mesencephala are distinct from each other, and these bodies are also separate from each other, except at the base. The cerebellum (epencephalon) does not differ materially from that of the Ophidia except in the case of the Geckonidæ. In as many of the genera as have been examined this region is represented by two commissures covering the fourth ventricle instead of one, the usual number in vertebrata.

The epiphysis is large in Sauria, while it is rudimental in Ophidia. It extends to the superior cranial wall, and its investing membrane is oppressed, tympanum-like, to the parietal foramen. Its superior expansion contains a varying amount of pigment, according to the type, and a layer of cells, forming a cup-like structure with concavity upward. This structure has been supposed to be an organ of special sense allied to sight. It is present in various conditions in most members of the Sauria, but is more or less rudimentary in all. In some forms there is no axial nervous connection with the brain. It is not unlikely that this is a remnant of an organ of special sense which was functional in some of the extinct Reptilia. There is a very large parietal foramen in the Plesiosauridæ, and I have found it still larger in the Permian Cotylosaurian family of the Diadectidæ. In a number of Reptilia a similar median body has been discovered close by the epiphysis—the parepiphysis. It resembles the former, but is more rudimental.

The sacculus endolymphaticus of the internal ear sends upward a branch, which differs in its extent in the different families. In the Geckonidæ it extends to the neck and terminates in a sac on either side behind the auditory meatus. This sac is filled with a mass of lime salt similar to that which composes the otoliths. This protuberance on the neck of these reptiles has excited not a little curiosity, and this feeling is rather stimulated than allayed by the knowledge of its direct connection with the organ of hearing.

II. SYSTEMATIC RELATIONS.

From the center of multiplicity of forms of typical Sauria, we can pursue three series—one toward the serpents by *Amphisbæna*, one to the partially degraded type of the Geckos, and lastly through the highest or pachygloss series, to *Chamæleon*.

In the first case, the prolonged development of the superior part of the proötic is followed by a decurving of the parietal border, the closer attachment of the occipital sclerotome, and shortening of the supratemporal and paroccipital. Finally the petrosal, with the pieces adjoining anteriorly, begin to restrict a foramen ovale, the orbitosphenoid is developed, and the articular and angular pieces of the mandible are represented by but one piece; the columella disappears. In the last direction, the petrosal is not elongate, nor is there any tendency toward

a more complete closure of the cranial cavity. The inferior wing of the petrosal is directed inward instead of forward; the parietal fontanelle does not diminish, and the premaxillary bone is seen to form a regularly decreasing series. The interclavicle and columella diminish in length and disappear, and the splenial becomes smaller and smaller to extinction. The subarticular strengthens the inner rather than the outer wall of the mandible, and the external direction of the coronoid is reversed.

In approaching the Geckos, the bones of the palate are seen to be thinner and more expanded, and the articular piece of the mandible is lost. In the full type the ossification is of the lightest description, and the fascial and basement membranes often present incomplete deposits of bony tissue; thus the parietal and sternal fontanelles disappear. The parietals are not, as usual, united, and there is a diminution (in *Uroplates* nearly obliteration), of the median or basilar segment of the occipital condyle. There is a temporal ala peculiar to this suborder.

The following is a synopsis of the prevailing characters of the suborders.

The arrangement adopted in this work is in general that of my system published in 1864,¹ but I have subordinated the divisions somewhat differently. This consists chiefly in distributing the divisions of the group I then proposed under the name of Pleurodonta, and regarding them as of equal rank with the other three primary suborders—Pachyglossa, Nyctisaura, and Opheosauri. This distribution establishes five additional suborders, and two new ones are added, the Geccovarani and the Anguisauri. The former of these is based on characters brought out by Boulenger in his essay on the classification of the Sauria,² the latter is made necessary by a different estimation of the characters I described in the memoir above mentioned. The number of suborders is thus eleven, and the families they embrace number twenty-two. For the characters of five of these families I am indebted largely to Boulenger.

As elsewhere, the orders and families of Sauria can not be arranged in a linear series. There are three lines whose terminal groups are the Chamæleontidæ, the Geckonidæ, and the Scincidæ respectively, and between these most of the families can be arranged. The suborders and families are as follows:

- I. Petrosal not produced anterior to semicircular canal and not articulating above with the parietal; olfactory lobes not underarched. Hemipenis mostly calyculate.
 - Digits, including metapodials, in opposing groups of two and three about a centrale carpi and tarsi respectively; tongue papillose, extremity sheathed; no clavicles RHPTOGLOSSA.
 - Digits all directed forward; clavicles proximally simple; interclavicle anchor-shaped; tongue papillose, not sheathed PACHYGLOSSA.

¹ Proceedings, Academy Natural Sciences, Philadelphia, 1864, p. 224.

² Ann. Mag. Nat. Hist., XIV, 1884, p. 117.

- II. Petrosal produced anterior to semicircular canal, not articulating above with parietal.
- α . Clavicle proximally expanded; olfactory lobe underarched by frontal.
Tongue papillose or smooth; hemipenis calyculate.....NYCTISAURA.
 - $\alpha\alpha$. Clavicle proximately simple; olfactory lobes underarched by frontal.
Vertebræ amphicelous; no supratemporal arch; tongue papillose. UROPLATOIDEA.
Vertebræ procœlous; a supratemporal arch; interclavicle anchor-shaped; tongue smooth; hemipenis fionced THECAGLOSSA.
 - Vertebræ procœlous; no supratemporal arch; tongue papillose; interclavicle simple; hemipenis fionced HELODERMATOIDEA.
 - $\alpha\alpha\alpha$ Clavicle simple proximally, olfactory lobes not underarched by frontal.
Interclavicle cruciform; tongue papillose; hemipenis fionced....DIPLOGLOSSA.
 - $\alpha\alpha\alpha\alpha$ Clavicle proximally expanded, olfactory lobes not underarched.
Vertebræ procœlous; tongue scaly; hemipenis fionced or plicate..LEPTOGLOSSA.
- III. Petrosal produced anterior to the anterior semicircular canal, articulating above with the border of the parietal.
- Olfactory lobes underarched by frontals; no supratemporal arch, nor scapular arch, nor sternum; cervical and caudal intercentra coössified with the middles of the centra.....ANNULATI.

The extinct family of the Dolichosauridæ probably represents another super-family, but its characters are not well known. It is so far only known from the Cretaceous bed of Europe. The genus *Dolichosaurus* (Owen) is remarkable for the large number of cervical vertebræ, there being not less than seventeen in the series.

III. PHYLOGENETIC RELATIONS.

The degradational tendencies of the Sauria have been already referred to, as especially exhibited in the reduction of the limbs. This has been associated with a close adhesion to a life on the ground, and ultimately with a life beneath the surface of the ground. Coincidentally with this habit there has taken place a reduction in the efficiency of the sense of sight. The eyelids have disappeared and the epidermis has become thickened over the cornea, and has ultimately assumed the character of the epidermis of the other parts of the head and body. The corium has in some cases closed over the orbit, so that total blindness has resulted.

These reductions are seen least in families and genera of arboreal habits. No member of the Rhiptoglossa, Nyctisaura, Acrodonta, or Iguania displays any of them. They are first seen to a limited degree in the Diploglossa, while they are very common in the Leptoglossa, and universal in the Typhlophthalmi and Amphisbænia. I give the following table which displays at once the degradational series of the limbs in the respective families in which it occurs. I also include some fusions of cephalic dermal plates.

Degradational series of the limbs of Lacertilia.

Normal: limbs, two pair; digits, 5-5.	Diploglossa.			Leptoglossa.			Typhlopthalmi.				Amphis- benia.
	Pygopodi- die.	Zonuridae.	Anguidae.	Tetidae.	Gerrho- sauridae.	Scolendae.	Acontidae.	Dibamidae.	Anelytro- pidae.	Anelli- dae.	
I. Limbs, two pair:											
(a) Digits, 4-5.....				Tretioscincus.....							
				Microblepharus.....							
(b) Digits, 5-4.....				Gymnophthalmus.....							
(c) Digits, 4-4.....			Saurelia.....	Telus.....							
				Scolecosaurus.....	Saurophila.....						
						Chamela.....					
						Rhinoscincus.....					
						Tetradactylus.....					
(d) Digits, 4-3.....						Miculia.....					
						Chalcidoseps.....					
(e) Digits, 3-3.....						Zygnopis.....					
				Microdactylus.....		Hemiergis.....	Nessia.....				
						Siaphus.....					
						Triardipes.....					
						Phaneroptis.....					
						Sepomorphus.....					
						Sphenoscincus.....					
						Seps.....					
						Sepsina.....					
(f) Digits, 3-4.....						Allodactylus.....					
(g) Digits with other com- binations exclusive of monodactyle.				Herpetochalcis.....		Chelomeles.....					
						Hemipodum.....					
(h) One or both limbs monodactyle.			Panolopus.....		Cetia.....						
	Chamae- saurea.			Chalcides.....		Rhodona.....					
				Ophiognomon.....		Soridia.....	Evesia.....				
						Anomalopus.....					
						Caloscincus.....					

II. Fore limbs only.	III. Hind limbs only.	Propus	Chirotes.	Chirotes.
Pygopus.	Mancus.	Pseudopus.	Oloochirus.	
Cryptodelma.		Opheodes.	Bipes.	
Delma.		Hyalosaurus.	Dumerilia.	Dihamus.
Pletholax.				
Aprasia.				
Lialis.				
		Anguis.	Ophioecinus.	Acontias.
			Herpetosaurus.	Typhlacontias.
			Herpetoseps.	
		Ophlosaurus.		
			Sepophis.	
			Ophiomorus.	
IV. No limbs				
			Anelytropis.	Amphisbaenide.
			Pygimia.	Lepidosternon.
			Typhlosaurus.	

Comparison of Diploglossa.—The degeneracy in this series is tolerably consistent in the order of its progress. In none of the genera are fore limbs present, and in three of them hind limbs are present. Notwithstanding the universal absence of fore limbs, a scapular arch is always present. This region shows, however, successive stages of degeneracy, as follows: In the three genera without posterior limbs the sternum has costal articulations; in the other three, none. In the genera with costal articulations the number of the latter diminishes regularly: in *Mancus*, three; in *Opheodes*, two; in *Pygopus*, one. Of the three genera with costal articulations, the interclavicle is present in two; in one (*Pygopus*) it is wanting. In the other genera it is present in a much modified form and position in one genus (*Ophisaurus*). Clavicles and coracoids are osseous in all of them; but the procoracoid is osseous in only two genera (*Opheodes* and *Pygopus*); while in the third genus with costal articulations (*Mancus*) it is cartilaginous, as in the genera without costals. The genera with costal articulations are also the only ones with osseous scapula. So we observe a certain order in the loss of parts. Thus, the part to disappear first is the interclavicle (to reappear in *Ophisaurus*); second, costal articulations and osseous scapula; third, sternum, which diminishes in size until greatly reduced, as in *Anguis* and *Dopasia*.

As regards the pelvic arch, reduction of its elements precedes the loss of limbs. Thus, *Mancus* is the only genus where the pubis and ischium meet (or in the ischium, are connected by an osseous hypogastroid) on the middle line. In *Opheodes*, where the posterior limbs are much as in *Mancus*, these elements are separated below the pubes widely. In *Pygopus*, where the limbs are better developed than in either, the inferior pelvic elements are rudimental and widely separated, being merely processes of the ilium. In the genera without limbs (*Ophisaurus* with a minute rudiment) this reduction is carried still further, the inferior elements not being distinguished from each other or from the ilium, the entire arch having a lateral position. Müller remarks of these parts in *Pseudopus*, *Ophisaurus*, and *Anguis*, that they are "zwar sehr ähnlich." The order of degeneracy, then, in the pelvic appendages in the *Diploglossa*, is, first, reduction of inferior pieces; second, loss of limbs; third, fusion of all the elements into a single lateral bone.

Comparison of the Leptoglossa.—In *Chalcides* we have nearly normal scapular and pelvic arches, while the limbs are very much reduced, though not to be termed rudimental. In the next stage of reduction, where all the limbs are present, but rudimental, the two arches show a considerable degradation, which is more marked in the scapular than in the pelvic. The pelvic elements remain much as in *Chalcides*, but reduced in size merely. In the scapular arch the sternum loses two costals, and the interclavicle loses the transverse processes. The clavicles become simple, and the ossification of the scapula and coracoid is reduced in extent. In *Propus*, where the fore limbs are much as in

Evesia, while the hind limbs have disappeared, the scapular arch has many points in common with *Evesia*. Thus, the clavicle and interclavicle are simple, and the sternum has only two costals. The scapular and clavicle are much better ossified. On the other hand, the pelvic arch displays a great reduction. In *Anelytropsis*, appropriately to the absence of fore limbs, there is no scapular arch. The pelvic arch is greatly reduced; but, curiously, there appears an element which resembles a corresponding element in the snakes. This arrangement is quite different from anything observed in the other *Leptoglossa* or in the *Diploglossa*, but is not without parallel in other *Sauria*, to be described later on.

The reduction of the scapular elements proceeds in the *Leptoglossa* on much the same lines as observed in the *Diploglossa*. The early simplification of the distal end of the clavicle is peculiar to the *Leptoglossa* as it is always simple in the *Diploglossa*. The late stages of reduction of the sternum seen in the limbless *Diploglossa* are not exhibited by any of the forms here described, although they probably exist, since we have the *Anelytropsis*, where the scapular arch is wanting. On the other hand, the extreme reduction of the pelvis seen in *Propus*, where the ilium only remains, has not yet been observed in the *Diploglossa* without posterior limbs.

Observations on Annulati.—The wide diversity between the pelvic structure in *Chirotes*, as compared with that of *Amphisbæna*, emphasizes the evidence furnished by the scapular arch in favor of regarding it as representing a family distinct from the *Amphisbænidae*. Even with the pelvic elements of *Chirotes* before us, it is difficult to be sure of the homology of the corresponding part in *Amphisbæna* and *Rhineura*. It can only be one of the two inferior elements, or femur. Against the latter supposition, which is suggested by the structure of the *Anelytropidae*, its anterior position is strong evidence. For the reason that it approximates closely the vent, its claim to be ischium is rather stronger than the supposition that it can be pubis. It is homologized by Fürbringer with the iliopectineal bone of the snakes.

General conclusions.—One conclusion is obvious, and this is that degeneracy of the scapular and pelvic arches follows degeneracy and loss of limbs, sooner or later. More special conclusions may be expressed as follows:

I. Anterior limbs have disappeared more generally than the posterior in the *Diploglossa*.

II. The limbs incline to degenerate and disappear more nearly *pari passu* in the *Scincidae*.

III. The anterior limbs have a tendency to persist longer in the *Teiidae* and *Amphisbænidae*. Future research may not sustain this proposition.

IV. The degeneracy in the scapular arch is delayed long after the degeneracy and loss of the anterior limbs.

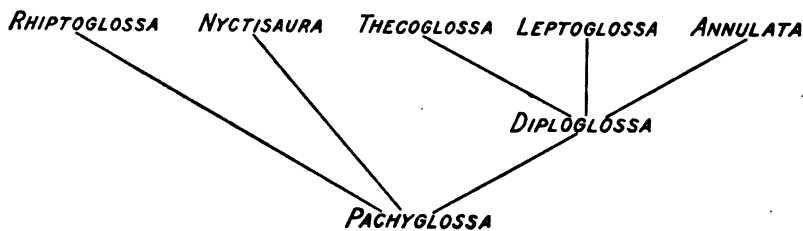
V. Degeneracy of the pelvic arch precedes the loss of the pelvic limb.

VI. The order of degeneracy of the elements of the scapular arch is (1) limb; (2) interclavicle (generally); (3) costal attachment; (4) sternum.

VII. The order of disappearance of parts in the pelvis is (1) pubis and ischium together (generally; see *Amphisbæna*); (2) limb; (3) ilium.

The conclusion that the rudimental condition of the arches and limbs is due to degeneracy is supported by paleontologic evidence, which shows that the ancestral orders of the Reptilia (Cotylosauria and Theromora) had well-developed limbs. Similar evidence shows that the Sauria and Ophidia had a common ancestor; but, as already remarked, whether that ancestor was a Theromora or a Rhynchocephal remains uncertain.

Within the limits of the Sauria the series of affinities expresses in some degree the phylogenetic succession. We can express these in a tabular form as follows:



This phylogeny presupposes that the superfamilies in which the petrous bone extends in advance of the anterior semicircular canal are of later origin, or were derived from those, in which this is not the case. It must be borne in mind, however, that this difference is of very ancient origin, since in the Permian epoch the Cotylosauria have the petrous bone developed forward, and the Pelycosauria have it much abbreviated. The Pythonomorpha of the Cretaceous also have the abbreviated petrosal in strong contrast to the existing Thecoglossa, where it is produced. Nevertheless the Pachyglossa display such affinities in many directions that they are probably ancestral to the other superfamilies. The dentition of the Agamidæ is quite identical with that of many of the Rhynchocephalia, and with that of the Chameleons as well. It is a modification of the primitive rhizodont dentition which prevailed during the Permian. The pleurodont dentition is another modification which points to the Iguanidæ as the starting point of the families which also possess that type of dentition.

The intermediary position of the Diploglossa between the thick and thin tongued lizards I pointed out in 1864, and its tendencies toward the Nyctisauria also are unmistakably seen in *Xenosaurus*. The Nyctisauria have degenerated in the characters of their vertebræ, for I do not believe this character to be of primitive origin, or to indicate that the superfamily is related to the Permian Pelycosauria, which have similar vertebræ.

The *Rhoptoglossa* (Chameleons) form an extremely specialized type, modified from the *Agamidæ* by loss of parts and modification of the feet. Their cranial characters are in some respects not a little like those of the Laramie Dinosaurian family of the *Agathaumidæ*, but this resemblance does not indicate affinity. Finally, the *Amphisbæni*ans (*Annulati*) are a group of whose origin it is difficult to learn. They may have come off from the common ancestors of the *Sauria* and *Ophidia*, but their resemblances to the *Annielloidea* render it possible that their point of origin may have been later in the scale. Their dental types differ quite like those of the *Pachyglossa*, and it is therefore clear that they were not derived from a pleurodont type, but like the *Pachyglossa* developed a pleurodont type independently. The discovery by Baur of this superfamily in the American Oligocene shows it to have been contemporary with the *Diploglossa*, which I discovered in the same horizon. In any case the *Annulati* show a nearer tendency toward the *Ophidia* than any other group of the *Sauria*.

IV. HISTORY.

The suborder of *Sauria* was first correctly defined and distinguished from the other divisions of *Reptilia* by Owen in 1841, under the name of *Lacertilia*. Previous to this date the division which included it was either too comprehensive on account of the admission of the *Loricata*, or deficient by reason of the reference of the serpentiform lizards to the *Ophidia*. Indeed Laurenti in 1768 included lizards, crocodiles, and salamanders in a division which he termed *Gradientia*, for which reason this name is not available for any natural division of animals. Brogniart in 1799 first proposed the term *Sauria*, but included the crocodiles, as did Daudin (1802), Duméril (1806), and Oppel (1811). Merrem in 1820 first separated the crocodiles from other reptiles under the name *Loricata*, and retained Oppel's name, *Squamata*, for the order as now generally adopted. The contents of the *Squamata* were, however, very incorrectly arranged and no progress was made in correctly distinguishing the *Sauria* from the *Ophidia*. Wagler in 1830 included the scaled reptiles in three groups, *Lacertæ*, *Serpentes*, and *Angues*, excluding the crocodiles as *Crocodili*. The *Angues* includes both *Saurian* and *Ophidian* genera.

In 1834 Duméril and Bibron issued the first volume of the *Erpétologie Générale*. The crocodiles are included in the *Sauria*. In 1841 Owen proposed a system of *Reptilia* based on studies of both the extinct and recent forms. He did not recognize the order *Squamata*, but regarded the lizards and snakes as representing orders, using the names *Lacertilia* and *Ophidia*. For the crocodiles he employed the name *Crocodilia* instead of the older *Loricata*. It was reserved for Johannes Müller to distinguish more exactly than his predecessors the *Sauria* from the *Ophidia*, his only error being the retention of the *Amphisbænia* (*Annulati*) in the latter. He wrote in 1837, and employed

the terms Sauria and Ophidia for the two divisions. Stannius in 1856 gave the first clear presentation of the contents of the Squamata in their natural relations. He embraced under the Sauria the three divisions, Amphisbænoidea, Kionocrania, and Chamæleonida, which are the forms now generally included by authors in the suborder.

As regards the contents of the suborder, Wiegmann first gave in the *Herpetologia Mexicana* an intelligible system based on structural characters. His work formed the basis of the later ones of Duméril and Gray. The characters employed by these authors were, however, external. In 1864¹ the present writer published a synopsis of the osteological characters of the Sauria, and proposed a system based on them. I used the names given by previous authors for groups where, as is usually the case, the characters of the skeleton coincide with those indicated by the tegumentary structures and tongue. In 1896 I reinforced these definitions by characters derived from the penial structures.²

RHIPTOGLOSSA.

Rhiptoglossi WIEGMANN, *Herp. Mex.*, 1834, p. 13.

Dendrosauria GRAY, *Cat. Liz.*, 1834, pp. 5, 264.

Chamæleonidea STANNIUS, *Zoot. Amph.*, 1856, p. 7.

Rhiptoglossa COPE, *Proc. Acad. Nat. Sci. Phila.*, 1864, p. 226.

Chamæleonidea GÜNTHER, *Phil. Trans.*, 1867, CLVIII, 1867, p. 626.

Rhiptoglossa BOULENGER, *Ann. Mag. Nat. Hist.*, (5) XIV, 1884, p. 120.

Petrosal bone not produced anterior to the anterior semicircular canal, and not articulating with the parietal above. Olfactory lobes not underarched by the frontal bones.

Digits including metapodials in opposing groups of two and three about a centrale carpi and tarsi respectively. No clavicles. Tongue papillose, with sheathed extremity. Hemipenis calyculate.

Many other peculiarities characterize the lizards included in this superfamily, but they are not such as appear to me to characterize a division of such high rank, but to pertain rather to the definition of the single family which it includes.

Some authors think that the Sauria should be primarily divided into three divisions: the Chamæleonida (= Rhiptoglossa), Kionocrania (remaining Sauria), and Amphisbænia. Boulenger divides the Squamata into four primary divisions, of which the Rhiptoglossa forms one, and the others are the lizards, Pythonomorpha, and the snakes. These views are due to the importance attached to an aggregate of characters, each one of which can be shown to be of no wide systematic value in the Squamata. Thus the absence of epipterygoid characterizes forms not widely removed (some of the Leptoglossa) from those which possess it. The interclavicle is absent in the chameleons, but it experiences great reduction to extinction in some other groups. Other characters will be mentioned under the family definition.

¹ Proceedings, Academy of Natural Sciences, Philadelphia, 1864, p. 224-230.

² *Idem.*, 1896, p. 461-467.

Boulenger,¹ in enumerating these characters, includes "vomer single" and "a supratemporal bone present" as of such importance as to require their separation as a suborder. The character "vomer single" is, however, an error, as the "vomer" (= maxillopalatines) is paired as in other Sauria. What is here called vomer is the inferior spine of the premaxillary. The supratemporal is homologous with that found in nearly all other Sauria.

But one family of Rhiptoglossa is known, as follows:

Teeth acrodont—that is, rooted in alveoli and coössified with their walls; external nasal openings bounded by the prefrontal and maxillary bones only; no epipterygoid; usual cranial arches present; vertebræ procelous; a sternum; no interclavicle; no osseous scales CHAMÆLEONIDÆ.

CHAMÆLEONIDÆ.

Caméléoniens CUVIER, Règne Anim., II, 1817, p. 50.

Prendentia MERREM, Tent. Syst. Amph., 1820, p. 161.

Chamæleonidæ GRAY, Ann. Phil. (2), X, 1825, p. 200.

Chamæleonoidea FITZINGER, Neue Classif. Rept., 1826, p. 15.

Theoglossæ WAGLER, part, Syst. Amph., 1830, p. 163.

Chamæleontes WIEGMANN, Herp. Mex., 1834, p. 13.

Caméléontens or *Chélopodes* DUMÉRIE and BIBRON, Erp. Gén., III, 1836, p. 153.

Chamæleontes FITZINGER, Syst. Rept., 1843, p. 41.

Chamæleonidæ GRAY, Cat. Liz., 1845, p. 264.

Chamæleontidæ COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 226.

This family possesses numerous peculiar characters besides those of the superfamily to which it has been referred. Some of these are found also in the Agamidæ. They are as follows:

Coronoid bone produced posteriorly on outside of ramus.

Articular present; separate from angular. Splenial reduced, more frequently wanting. Subarticular small on outer, much prolonged on inner face of ramus.

Groove from splenial to mental foramina not closed over Meckel's cartilage.

Premaxillary nearly always separated from vomer by maxillaries.

Pterygoids not touching body of sphenoid or reaching quadrate.

Parietal single, receiving the gomphosis of loosely attached occipital segment internally. Frontals united.

Sternum without fontanelle.

No angular process of mandible.

Abdominal ribs present.

The viscera present the following peculiarities: The observations are made on *Chamæleon basiliscus* and *C. planiceps*. The liver is adjacent to the heart, and is compressed, so that the vertical diameter much exceeds the transverse. It is two-lobed, the left lobe much smaller in every way than the right. The gall bladder is entirely posterior to, but adjacent to, the liver. The alimentary canal exhibits stomach, small

¹ Cat. Liz. Brit. Mus., 2d ed., III, p. 437.

intestine, colon, and rectum. The small intestine is short and little plicate, and the colon is short and has a cæcum.

According to Stannius, the lungs are digitate at the extremity and along the inner borders. Wiedersheim states that the proximal part of the lung is shortly divided longitudinally into three parts, each of which has a separate connection with the bronchus.

The mesenteries include the usual hepato-ventral, epigastric, gastro-hepatic, and right hepatic, the last including the right lung. The left lung is included in a left hepatogastric, a feature seen in few other groups, notably as the Anoline Iguanidæ. There is also a left hepato-lateral, from the liver to the left body wall, having a direction diagonal to the long axis of the liver in *C. basiliscus*.

The greater part of the surface of the hemipenis is coarsely calyculate, generally in a transverse direction. There are remarkable papillæ at the apex, which differ in the different forms. In the *C. pardalis* there is a kind of membranous apron proximad of the papillæ, which presents an apex proximad opposite to the sulcus spermaticus. In the *C. vulgaris* and *C. gracilis* the papillæ are erect, laminiform, and transverse, and serrate on the edges. The principal pair have a few papillæ in front of and behind them, and in the *C. gracilis* there is behind these, on each side, an oval body which is composed of three serrate laminæ packed obliquely together. In the *C. gracilis* the proximal laminæ are low and have a margin of acute tubercles, and each serves as a collar to a much larger papilla. The latter is largely free and tongue-shaped, with the apex proximad, and its flat external surface is covered with three or four rows of conic papillæ.

Boulenger thus summarizes the general characters of the Chameleons:

Tongue cylindrical, extremely extensile and projectile, sheathed at the base, club-shaped and viscous at the end, with an exceedingly elongate glossohyal bone.

The head usually forms a bony casque, ornate with crests or tubercles. The inter-orbital septum is present, and a small columella cranii distinguishable. (This is not the columella (epipterygoid), but the postoptic Cope.) Premaxillary extremely small, edentulous (sometimes. C.); orbit bony all around, the pre- and postfrontals often joining to form a supraorbital roof; a pair of supranasal fontanelles, bordered by the nasals, the prefrontals, and the frontal; latter bone single; parietal foramen, if present, pierced in the frontal; parietal single, often much narrowed and compressed, forming a crest, and meeting posteriorly the extremities of a pair of bones, the supratemporals, which on each side connect it with the squamosal. (This should be paroccipital. C.) In some species the parietal in the adult may be much expanded, and form a bony slab from which the supratemporals are no longer to be distinguished. Dentition acrodont; teeth compressed, triangular, more or less distinctly tricuspid. Palate toothless. Eyes large, covered by a thick granular lid pierced with a small central opening for the pupil. No tympanum. Body compressed; neck very short. Vertebrae procelian. Abdominal ribs present. Limbs long, raising the body. Digits arranged in bundles of two and three; in the hand the inner bundle is formed of three, the outer of two digits; it is the reverse in the foot. Tail prehensile. Head and body covered with granules or tubercles.

Physiologically as well as anatomically Chamæleons stand by themselves among reptiles, as is evidenced by the mobility and independent action of their eyes, the projectility of their tongue, the slow and deliberate movement of their limbs. The

changeable hue of their skin, first noticed in them, is a peculiarity shared by many other lizards, and to an equal if not stronger degree by *Calotes*.

About one-half of the species occur in Madagascar and neighboring islands, the other half in Africa; the common *Chamæleon* is Mediterranean, occurring in Europe, however, only in Andalusia; a species inhabits Socotra, another South Arabia, and a third India and Ceylon.

Synopsis of the genera:

Claws simple; scales on soles smooth; tail at least as long as the body.

Chamæleon Laurenti.

Claws simple; scales on soles spinose; tail shorter than body..... *Brookesia* Gray.

Claws bicuspid; scales on soles spinose; tail shorter than body. *Rhampholeon* Günther.

Siebenrock¹ has described the osteology of the *Brookesia superciliaris* Kuhl, which he shows possesses a number of peculiarities which distinguish it from the species of the genus *Chamæleon*, and, in fact, from all known genera of Vertebrata. From the fourth cervical vertebra to the eighteenth caudal, inclusive, the zygapophyses of each side are connected by a longitudinal osseous bar. This bar gives origin on the dorsal vertebrae to a transverse process which is above the true transverse process and more prominent. It is called by Siebenrock "accessorischer querer Fortsatz," which may be classicized into epidia-physis. Further, the prezygapophyses are connected by a bony arch which is fused on the middle line with the neural spine, on the dorsal vertebrae, from the second to the ninth, inclusive. In the cranium the frontal and parietal are greatly expanded. The former reaches the orbit, excluding the pre- and postfrontals. The parietal excludes the occipital from view when seen from above. There are teeth on the premaxillary bone.

In the genus *Chamæleon* the prefrontals and postfrontals exclude the frontal from the orbit. The vertebrae are normal.

In spite of the peculiarities of the *Rhaptoglossa* I supposed that they were derived from the *Pachyglossa*. Many of their characters are present in genera of the *Agamidæ*, leaving but few to be accounted for, as of later and separate origin. Of the latter kind are the peculiarities of the external nostrils, and metapodials. The characters of the premaxillary, mandibular composition and scapular arch are nearly approached or imitated by some of the *Agamidæ*; and in some of the latter the epipterygoid becomes much abbreviated.

PACHYGLOSSA.

Pachyglossa WAGLER, Natür. Syst. d. Amphib., 1830, p. 144.—FITZINGER, Syst. Rept., 1843, p. 43.—GRAY, part, Cat. Liz. Brit. Mus., 1st ed., 1845, p. 5.

Strobilosaura GRAY, Cat. Liz. Brit. Mus., 1st ed., 1845, p. 5.

Acrodonta pachyglossa + *Pleurodonta iguana* COPE, Proc. Acad. Nat. Sci. Phila., 1864, pp. 225, 226.

Petrous bone with superior plate not produced anterior to anterior semicircular canal, and with a longitudinal wing only. Vertebrae procoe-

¹ Sitzungsber. K. K. Akad. Wiss. Wien, CII, 1893, p. 71.

lous. Clavicle simple proximally. Interclavicle anchor-shaped. Premaxillary undivided. Parietal single, receiving the loosely articulated occipital inferiorly. Frontal not underarching olfactory lobes. Tongue papillose, the apex not retractile.

As to the visceral anatomy, the following points are characteristic:

Liver short and contracted proximally or semipyriform, the posterior border more or less emarginate by one or sometimes two notches; the right lobe more produced than the left, and terminating in a narrow strip which reaches the reproductive cells. Gall bladder partly exposed on the posterior margin.

Alimentary canal with stomach, small intestine, and rectum well distinguished, and also a short colon adjacent to the rectum, which frequently presents a short proximal cæcum. Corpora adiposa free anteriorly. Kidneys posterior in position; a urinary bladder. Ventral mesentery extending to posterior border of liver and beyond it to a fold of the small intestine.

This superfamily embraces the most vigorous branch of the order and includes the largest species, excepting the Thecaglossa. Its point of contact with the other superfamilies is through the Diploglossa, and especially the Zonuridæ. In my first system of the Sauria I divided the Pachyglossa, as had been done by others, into two superfamilies, and associated one of them with the Chamæleonidæ, and the other with the Leptogloss and Diplogloss superfamilies. This was because I had discovered numerous osteological characters which appeared to justify this arrangement. It is, however, clear that, as various authors have shown, the Chamæleonidæ represent a distinct superfamily. I am of the opinion also that the points of agreement which I have discovered in the anatomy of the acrodont and pleurodont divisions of the Pachyglossa are more important than the differences, and as these points are of the exact grade which define the superfamilies, I return to the system of Wagler and Fitzinger, pointing out at the same time the various osteological characters in which the pleurodont division agrees with other lizards and differs from the acrodont division.

These two divisions or families differ as follows:

Dentition acrodont; that is, the shanks of the teeth inclosed between two alveolar walls, with which they are frequently connate	AGAMIDÆ.
Dentition pleurodont; that is, the shanks of the teeth attached laterally to the inner side of the single and external alveolar wall	IGUANIDÆ.

In the Agamidæ the premaxillary bone is nearly always separated below posteriorly from the vomer by the intervention of the maxillaries. The coronoid bone is produced posteriorly and not anteriorly on the outside of the mandibular ramus. The splenial bone is of reduced size and is most frequently wanting; and the articular is much more developed on the inner than on the outer side of the ramus. The groove of Meckel's cartilage is not roofed over between the splenial and internal mental foramina. In all the above characters the Agamidæ agree with the Chamæleonidæ.

In the Iguanidæ, the premaxillary is very seldom separated from the vomer on the palatal face. The coronoid bone is produced anteriorly and not posteriorly on the external face of the ramus. The splenial bone is well developed, and the Meckelian is more or less roofed over. The angular bone is much more developed on the external than the internal face of the ramus. In these characters the Iguanidæ agree with the majority of the Diploglossa and Leptoglossa.

In neither family are the temporal fossæ overroofed with ossification, nor do any of their members exhibit osteodermal plates.

The Agamidæ are restricted to the Old World. The Iguanidæ inhabit the New World, Madagascar, and the Fiji Islands.

AGAMIDÆ.

Iguaniens CUVIER, part, Règne Anim., II, 1817, p. 29.

Ascalabotæ MERREM, part, Tent. Syst. Amph., 1820, p. 39.

Stellionidæ GRAY, part, Am. Phil. (2), X, 1825, p. 196.

Pneustoidea, *Draconoidea*, *Agamioidea* FITZINGER, part, Neue Classif. Rept., 1826, p. 11.

Agamidæ GRAY, Phil. Mag. (2), II, 1827, p. 57.

Pachyglossæ WAGLER, part, Syst. Amph., 1835, p. 141.

Dendrobata emphyodontes and *Humivagæ emphyodontes* WIEGMANN, Herp. Mex., 1834, pp. 13, 17.

Iguaniens acrodontes DUMÉRIEUX and BIBRON, Erp. Gén., IV, 1837, p. 375.

Gonyocephali, *Calotæ*, *Semiophori*, *Octocryptas*, *Lophuræ*, *Dracones*, *Trapeli*, *Stelliones*, *Leiolepides*, *Phrynocephali* FITZINGER, Syst. Rept., 1843.

Agamidæ GRAY, Cat. Liz., 1845, pp. 5, 230.

Agamidæ COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 227.

Agamidæ and *Uromastixidæ* THEOBALD, Journ. Linn. Soc., X, 1868, pp. 33, 34.

Agamidæ BOULENGER, Ann. Mag. Nat. Hist. (5), XIV, 1884, p. 119; Cat. Liz. Brit. Mus., 2d ed., I, 1885, p. 250.

The following are some of the osteological characters of this family:
Teeth in alveola, coossified with them in adults (acrodont.)

Premaxillary generally separated from maxillopalatines by maxillaries, small, undivided.

Splenial small, or more frequently wanting; Meckelian groove open; angular and surangular distinct, the former small on outer, much prolonged on inner face of ramus. Coronoid produced posteriorly on external face of mandible.

An examination of twelve genera of this family shows that the visceral characters agree in general with those of the Iguanidæ. The liver is bilobate posteriorly in *Calotes* and in *Uromastix*; more conspicuously so in the latter, where the posterior border is deeply emarginate. In *Amphibolurus barbatus* and *Megalochilus auritus* the border is trilobate; in the former the middle lobe is more than usually distinct and lies superior to the right and left lobes. In these two species also the ventral mesentery is bifurcate to the proximal end of the liver. In the *A. barbatus* the cystic mesentery is short, and the urinary bladder is rudimental. In *Megalochilus* the small intestine is rather short. The

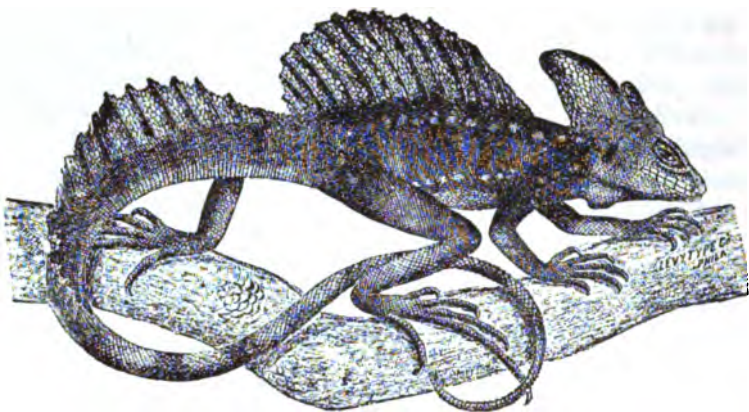


fig. 6.

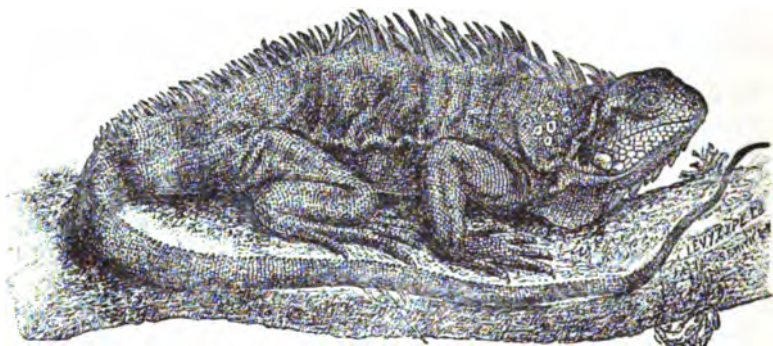
IGUANIDÆ. *BASILISCUS PLUMIFRONS* COPE.

Fig. 7.

IGUANIDÆ. *IGUANA TUBERCULATA* LINNÆUS.

Fig. 8.

IGUANIDÆ. *PHYMATURUS PALLUMA* MOLINA.

Fig. 9.

IGUANIDÆ. *PHRYNOSOMA CORNUTUM* HARLAN.

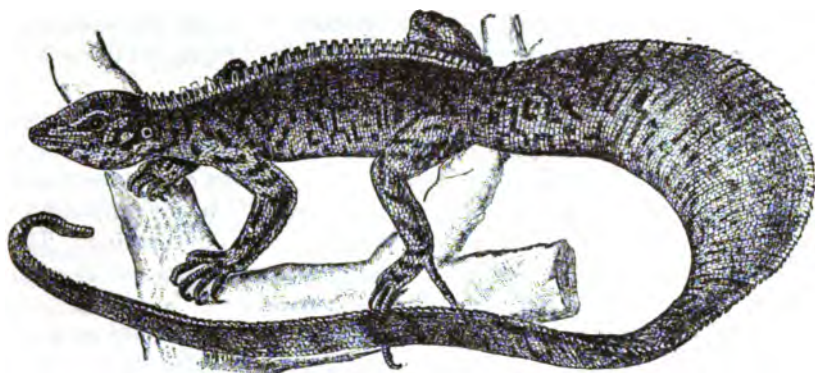


Fig. 10.

AGAMIDÆ. *LOPHURA AMBOINENSIS* SCHLOSSER.



Fig. 11.

AGAMIDÆ. *PHYSIGNATHUS MENTAGER* GÜNTHER.

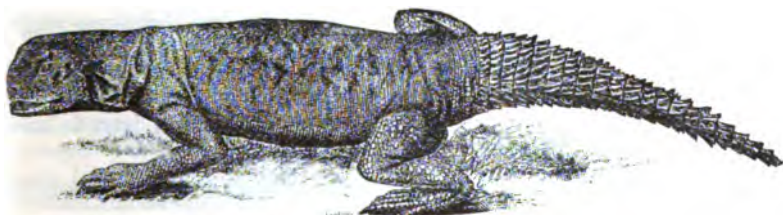


Fig. 12.

AGAMIDÆ. *UROMASTIX SPINIPES* DAUDIN.

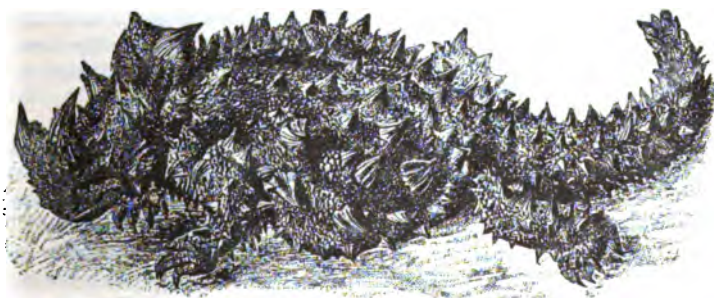


Fig. 13.

AGAMIDÆ. *MOLOCH HORRIDUS* GRAY.

colon is generally present, and the cæcum is quite conspicuous in *Draco*, *Stellio*, and *Agama* (*aculeata*), and less so but present in *Lophura*, *Calotes*, *Uromastix*, and *Phrynocephalus*.

The mesenteries present the usual sheets, hepatovenral, gastrohepatic, left gastropulmonary, right hepatic, which includes the right lung. I have noted the following modifications: In *Agama colonorum* the left gastropulmonary has become a right gastrohepatic by its continuing to the liver, a character observed in *Chamaeleon* and the *Anolinæ*. There is also in this species a left hepatomarginal. In *Megalochilus auritus* there is a right hepatovenral, as in *Phrynosoma*.

I have had the opportunity of examining the hemipenes of a relatively small number of species of this family. As already remarked, the surface is generally calyculate. I have not found terminal papillæ in the genera *Uromastix*, *Agama*, *Liolepis*, *Physignathus*, or *Calotes*. The general construction is, that opposite the sulcus spermaticus is a strong longitudinal welt. Near the apex this welt becomes adherent to the side on which the sulcus runs, dividing the organ into two apical



Fig. 14.

IGUANIDÆ. *CROTAPHYTUS WISLIZENII* BAIRD AND GIRARD.

portions. The sulcus bifurcates and passes along the base of this partition. In *Liolepis* there are two welts inclosing a smooth space between them. In *Calotes cristatellus* there is a lesser welt on each side of the principal one. In all the genera the basal part is smooth and it is sometimes thrown into longitudinal folds.

Boulenger makes the following general remarks on the Agamidæ:

The chief character by which the lizards of this family are at once distinguished from their allies is the acrodont dentition. The teeth may usually be divided into three kinds, viz, incisors, canines, and molars. The latter are more or less compressed, frequently tricuspid; regular canine teeth are present, one or two on each side, in most of the genera; in *Uromastix* and *Aporoscelis*, however, these enlarged teeth are absent, and the anterior lateral teeth wearing out with age, a toothless cutting edge is left between the molars and the incisors, which, in these two genera, unite in the adult to form a large single or divided cutting tooth.

The skull is less depressed and more strongly ossified than in the preceding families, and postorbital and postfronto-squamosal bone arches are well developed; in *Lyriocephalus*, as in several Iguanoids, another arch is formed by processes of the præ and postfrontals which unite surrounding a large supraorbital fossa. The premaxillary is single, the nasals are double, and the frontal and parietal single; the pterygoids are usually widely separated and constantly toothless; the os transversum is strongly developed; a columella cranii is present. Dermal ossifications on the skull are constantly absent. The fore limbs are well developed, and, except in

Sitana, which lacks the outer toe, pentadactyle. The clavicle is not dilated, and the interclavicle is T-shaped or anchor-shaped, frequently small; the sternum usually presents two fontanelles, which however, are missing in *Lyriocephalus* and *Moloch*, the latter genus being especially remarkable for having the sternum divided longitudinally.

The tympanum is either exposed or concealed under the skin. The eye is small and the pupil round; eyelids well developed. The tongue is thick, entirely attached or slightly free in front, not, or but slightly, nicked anteriorly; it is more free, protractile, and more distinctly incised in the herbivorous genera *Lophura*, *Liolepis*, and *Uromastix*.

Femoral and præanal pores are absent in the majority of the genera; it is a remarkable fact that they exist, at least in the males, in all Australian genera but one (*Chelosania*, known as yet from a unique specimen), whereas they are missing in all others except *Uromastix* and *Liolepis*. There are no symmetrical plates on the head or on the belly; and ornamental appendages, such as crests, gular pouches, etc., are frequently present, either in the males only or in both sexes. The tail is usually long and not fragile; it is prehensile only in the genus *Cophotis*, and some *Phrynosophali* have the curious faculty of curling upward the extremity of that organ.

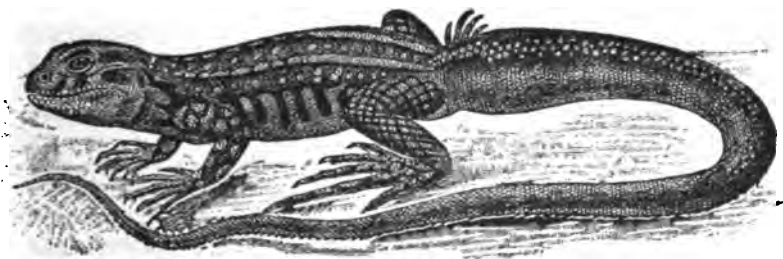


Fig. 15.

AGAMIDÆ. *LIOLEPIS BELLII* GRAY.

The digits are usually keeled inferiorly or denticulated laterally. The shape of the body as well as the scaling vary considerably, according to the genera, and in adaptation to the modes of life. Generally speaking, ground Agamoids have the body depressed, and arboreal compressed, but a division of the genera into terrestrial and arboreal, which has hitherto been almost generally accepted, must be given up as impracticable and unnatural. Most Agamoids are exclusively insectivorous; *Lophura*, *Liolepis*, and *Uromastix* are herbi- or frugivorous, while some species of *Agama* have a mixed diet; again, a systematic division into insectivorous and herbivorous, as has been proposed by Theobald, would be as unsatisfactory as that into terrestrial and arboreal.

Leaving out the strongly specialized genera *Draco* and *Moloch*, all the forms pass very gradually one into another in different directions, rendering a sharp generic division, and, still more, a serial arrangement, a matter of great difficulty.

The Agamidæ inhabit Africa, Asia, Australia, and Polynesia. They are most numerous in species as well as in genera in the Indian region. In Africa they are represented by only three genera, viz, *Agama*, *Aporoscelis*, and in the northern parts, *Uromastix*. Four species extend slightly beyond the limits of Asia and Africa into southeastern Europe. They are absent from Madagascar and New Zealand.—Boulenger.

Boulenger defines the genera of this family as follows:

I. Mouth large; teeth erect in both jaws.

A. Incisors small, conical.

1. No true præanal or femoral pores.

α Ribs much prolonged, supporting a wing-like dermal expansion.

Draco Linnaeus.

$\alpha\alpha$ No wing-like lateral expansion.

a. Body not depressed.

* Four toes only *Sitana* Cuvier.

** Five toes.

† Tympanum hidden.

Fifth toe short, not longer than first; no dorsal crest *Otocryptis* Wiegmann.

Three parallel longitudinal folds on each side of the middle of the throat, curved and converging backwards, forming a U-shaped figure.

Ptycolæmus Peters.

A dorsal crest; scales small; no fold across the throat nor in front of the shoulder.

Aphanotis Peters.

A dorsal crest; scales very large, subequal, irregular; tail prehensile *Cophotis* Peters.

No dorsal crest; a large rostral appendage, at least in the male. *Ceratophora* Gray.

No dorsal crest; dorsal scales small, intermixed with very large conical tubercles.

Phoxophrys Huber.

A dorsal crest; a V-shaped gular fold; a bony supraorbital arch. *Lyriocephalus* Merrem.

A dorsal crest; an oblique fold in front of the shoulder. *Japalura* Gray.

†† Tympanum exposed.

Digits not keeled inferiorly.

Lophocalotes Günther.

Snout ending in a long compressed appendage.

Harpesaurus Boulenger.

A strong fold across the throat.

Gonyocephalus Kaup.

No fold across the throat; dorsal scales unequal; no gular pouch. *Acanthosaura* Gray.

No fold across the throat; dorsal scales large, unequal; males with a gular pouch.

Salca Gray.

No fold, or a very feeble one, across the throat; dorsal scales equal *Calotes* Cuvier.

No fold across the throat; scales minute, equal; a gular pouch. *Chelosania* Gray.

β Body more or less depressed.

Tympanum exposed; males without calose præanal scales. *Charasia* Gray.

Tympanum exposed; males with calose præanal scales. *Agama* Daudin.

Tympanum concealed. *Phrynocephalus* Kaup.

2. True præanal or femoral pores, at least in the males.

Body depressed; tympanum distinct; femoral and præanal pores *Amphibolurus* Wagler.

Body depressed; tympanum hidden,

Tympanocryptis Peters.

Body slightly depressed; no femoral pores,

Diporophora Gray.

Body compressed; toes denticulated laterally,

Physignathus Cuvier.

Body slightly compressed; neck with a large frill-like expansion. *Chlamydosaurus* Gray.

Body compressed; toes lobate *Lophura* Gray.

Body depressed; no præanal pores,

Liolepis Cuvier.

AA. Incisors united into one or two large cutting teeth; tail short, with whorls of spines.

Femoral and præanal pores.. *Uromastix* Merrem.

No true pores. *Aporoscelis* Boulenger.

II. Mouth very small; teeth in the upper jaw horizontal, directed inward; body covered with large spines. *Moloch* Gray.

No genus of Agamidæ is found in America, where the Iguanidæ represent them. The two families present some interesting parallels, which show the effects of identical causes in producing similar effects on the organism. These parallels are seen in the depressed form of the terrestrial forms in both families and the relatively compressed form of the arboreal types. In both families the former have representatives with horny processes on the head and on the scales of the body; and in both are types with horny spines on the tail. Among arboreal forms we find genera of both families with series of horny processes forming a median dorsal crest, and in others a prolongation of the spines of the dorsal and caudal vertebræ, producing a like result.

	IGUANIDÆ.	AGAMIDÆ.
Abdominal ribs.		
No abdominal ribs.	Polychrus.	• • •
Ribs greatly prolonged into a lateral wing.		Draco.
Ribs not prolonged.		
Arboreal types, generally compressed.		
A dorsal and caudal fin supported by bony rays.	Basiliscus (no fem. pores).	Lophura (pores).
No vertebral fin.	No femoral pores.	
Form slender, scales in equal series.	Calotes. } Bronchocela. }	Laemactus.
Form elongate; eyebrows elevated, tail compressed.	Gonycephalus.	Ophryossa.
Form stouter, scales less regular.	Hypsibates.	Tiaris.
	Femoral pores.	
Low crested; small hyoid disk.	Brachylophus.	Diporophora.
High crested; large hyoid disk.	Iguana.	Physignathus.
Tail with spinous whorls.	Cyclura.	
Terrestrial types of flattened form.		

Femoral pores.

Tail with whorls of spiny scales.	Hoplocercus.	Uromastix.
Tail long, simple; scales small.	Crotaphytus.	Lirolepis.
Tail simple, scales large.	Sceloporus.	" "

No femoral pores; preanal pores.

Tail with whorls of spines.	" " "	Stellio.
Tail, simple, not elongate, ear open.	Proctotretus.	Agama.

Neither femoral nor anal pores.

Ear exposed.	Much flattened, tail short, scales irregular.	
	Phrynosoma.	Moloch.
Ear concealed.	(Doliosaurus, s. g.)	{ Phrynocephalus. Megalochilus.

IGUANIDÆ.

Iguaniens CUVIER, part, Règne Anim., II, 1817, p. 29.

Ascalabota MERREM, part, Tent. Syst. Amph., 1820, p. 39.

Pneustoidæ, Agamoidea, FITZINGER, part, Neue Classif. Rept., 1826, p. 11.

Iguanidæ GRAY, Phil. Mag. (2), II, 1827, p. 56.

Pachyglossæ WAGLER, part, Syst. Amph., 1830, p. 144.

Dendrobata prosphyodontes and *Humivagæ prosphyodontes* WIEGMANN, Herp. Mex., 1834, pp. 5, 18.

Iguaniens pleurodantes DUMÉRIL and BIBRON, Erp. Gén., IV, 1837, p. 61.

Corythophanæ, Hypsilophi, Ptychosauri, Polychri, Dactyloæ, Draconturæ, Heterotropides, Steirolepides, Doryphori, Phrynosomata FITZINGER, Syst. Rept., 1843.

Iguanidæ GRAY, Cat. Liz., 1845, pp. 5, 178.

Anolidæ, Iguanidæ COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 227.

Iguanidæ BOULENGER, Ann. Mag. Nat. Hist. (5), XIV, 1884, p. 118.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., 1885, II, p. 1.

Osteological characters of this family are as follows:

Teeth pleurodont, the roots anchylosed to the internal side of the premaxillary and maxillary bones. Premaxillary not cut off from maxilla-palatines by maxillaries.

Splenial well developed; Meckelian groove mostly closed; angular little developed on inner, much on outer side of ramus; coronoid produced anteriorly, not posteriorly, on outer face of ramus.

Vertebrae procœlous.

The varieties of visceral structure in this family are not very great. In the especially herbivorous genera the colon is much enlarged in diameter, and in *Iguana* it is divided by numerous partial septa. The liver generally has but a single posterior emargination, but in *Anolis*, *Microlepis*, *Crotaphytus*, and *Phrynosoma* there are two incisions, thus producing a short median lobe. The border is variously excavated to accommodate the folds of the small intestine and colon. Thus in *Holbrookia*, *Crotaphytus*, *Læmanctus*, *Sceloporus*, *Uta*, and some *Phrynosomata*, the border is deeply concave to the right of the middle line. In *Liocephalus*, *Liolaemus*, *Callisaurus*, and some *Scelopori*, and *Phrynosomata* it is deeply excavated medially.

The hepatic mesenteries conform to the general type, with certain exceptions to be mentioned. Thus there are no right or left lateral hepatic mesenteries, and but one ventral. The right hepatic supports the right lung. There is frequently a rudimental right lateral hepatic, which connects the long right apex of the liver with the right body wall. There is a gastrohepatic which generally spreads caudad over the space inclosed in the bend of the stomach. There is no left gastroparietal sheet or band. The most remarkable deviation from this type (which I have verified in twenty genera), is found in the *Anolinæ*. Here the left lung, besides its superolateral connection with the stomach, is connected by a special sheet with the left part of the inferior face of the liver, forming the left gastrohepatic. Thus the latter organ is suspended by two sheets to the left side of the middle line. In genera where this is the case the two sheets are sometimes difficult to distinguish, owing to their easy adhesion together. They may be separated by inserting a probe from the free caudad extremity of the lung.

Another variation from the normal type is seen in the presence of a right lateral hepatic sheet in *Phrynosoma* and *Polychrus* (in *P. guttuerosus* it is wanting in the one specimen examined). A left lateral sheet is present on the proximal half of the liver in *Cyclura cornuta* and *Polychrus marmoratus*. It is rudimental in *Polychrus acutirostris*, and wanting in *P. guttuerosus*. There is a gastroparietal band in *C. cornuta*, which is joined by the apex of the peritoneum of the corpus adiposum.

I have examined the hemipenis in thirty species of this family of the following genera: *Anolis*, *Xiphocercus*, *Polychrus*, *Basiliscus*, *Ctenosaura*, *Cyclura*, *Iguana*, *Corythophanes*, *Sauromalus*, *Crotaphytus*, *Dipsosaurus*, *Liocephalus*, *Sceloporus*, *Callisaurus*, *Holbrookia*, *Enyalioides*, *Doryphorus*, *Microlophus*, *Uraniscodon*, and *Phrynosoma*. These differ in the bifurcation of the organ, varying from undivided (*Cyclura*, *Iguana*) to deeply bifurcate (*Anolis*, *Doryphorus*, *Microlophus*, *Uraniscodon*). Other differences are seen in the number of the welts and their surface structure, and the distribution and size of the calyces. Thus the calyces extend to the base in *Anolis*, but are confined to the apex in *Crotaphytus*. They exist in series only in *Cyclura*, *Iguana*, *Ctenosaura*, *Corythophanes*, and *Sauromalus*. They cover most of the organ in *Sceloporus* and *Phrynosoma*. The systematic arrangement of the genera in accordance with the characters is as follows:

I. Calyces always present.

- A. Three welts, one opposite the sulcus spermaticus, and one parallel on each side of it, transversely laminate.

Ctenosaura, *Cyclura*, *Iguana*, *Corythophanes*, *Sauromalus*, *Crotaphytus*.

- B. Three welts, one opposite sulcus, the others one on each side of sulcus, converging to median welt and inclosing spaces with it. Surfaces calyculate.

- α. Welt confluent proximad.

Dipsosaurus, *Liocephalus*, *Phrynosoma*.

- αα. Welt projecting free proximad.

Callisaurus, *Holbrookia*.

C. No median welt; lateral welts from sulcus.

Sceloporus.

D. A median, no lateral welts; calyculate.

α. Not bifurcate; welt wide.

Enyalioides (calyces coarse).

αα. Bifurcate; welt long and narrow.

Anolis (calyces minute).

E. No welts.

α. Deeply bifurcate; calyces confined to branches.

Microlophus, *Uraniscodon*, *Doryphorus*.

αα. Shortly bifurcate; calyces extending proximad of branches.

Basiliscus.

II. No calyces or welts.

α. Bifurcate; surface coarsely wrinkled.

Polychrus.

In the genera *Ctenosaura*, *Cyclura*, *Iguana*, *Sauromalus*, and *Enyalioides* (*laticeps*) the organ is entire; in the others it is bilobate or bifurcate.

Boulenger makes the following observations on this family:

The lizards of this family resemble very closely, in external as well as internal characters, those of the preceding, or Agamidæ, from which they are distinguished by the pleurodont dentition. The distinct heterodontism, so frequent in the latter family, is exhibited to a slight degree by one genus only (*Uraniscodon*); in all others the teeth are subequal in size, and if, as is usually the case, the lateral ones differ from the front ones, the change is gradual. In all genera, save *Amblyrhynchus*, *Conolophus*, and *Phymaturus*, the anterior teeth are conical; the lateral ones are also sometimes simply conical or with obtuse crowns, but more frequently compressed and tricuspid; in *Iguana* and *Cyclura cornuta* the crowns are finely denticulated on the edge. In the above-named highly remarkable *Amblyrhynchus*, *Conolophus*, and *Phymaturus* all the teeth are deeply trilobate or flower-de-luce shaped. The shafts of the teeth are constantly long and cylindrical and hollowed out at the base. Pterygoid teeth are present in many species; I have not employed this character for the distinction of genera unless accompanied by others. *Chamaleolis* is one of the few lizards in which teeth are inserted on the palatine bone.

The skull does not differ in any important point from that of the Agamidæ. However, dermal cranial ossifications, as, for instance, the horn-like tubercles of *Phrynosoma*, may be present. A supraorbital arch, such as has been noticed in the Agamoid genus *Lyriocephalus*, *Corythophanes*, and *Phrynosoma*. The clavicle is slender proximally, except in the genera *Basiliscus* and *Lamachus*. The interclavicle is T- or anchor-shaped, except in *Phrynosoma*, in which the longitudinal limit is absent. The sternum is frequently perforated by a fontanelle. A more or less complete system of ossified or tendinous abdominal ribs is developed in many genera, in some (*Anolis*, *Polychrus*, *Liosaurus*, etc.) to the same extent as in the Geckonidæ.

The tongue is thick and villose, entirely fixed to the floor of the mouth, or slightly free anteriorly, and not, or but feebly, nicked. The pupil of the eye is round and the eyelids well developed. The tympanum is distinct, except in *Holbrookia*.

Femoral pores exist in all North American genera, and are absent in the great majority of the South American. In some of the latter the males have a series of pores on the anterior border of the vent. When femoral pores are present in North American genera they are pierced in an undivided scale.

The scaling of the head and body varies extremely, and gular appendages, crests, and other ornaments are not infrequent. The upper head scales are usually small, but in some genera assume a shield-like disposition. An enlarged scale is usually present, representing the interparietal of other lizards, and through fusion with adjacent scales sometimes acquires a remarkably large size. Following the example of previous authors, and for convenience, I have used the term "occipital" for this

shield, although it is not homologous with that so called; but I have had to depart from this rule in dealing with the genus *Liolaemus*, in which, owing to the greater development of the parietals and the presence of a true occipital, that terminology might have led to confusion.

The habits of the numerous members of this family are as varied as their physiology. All the forms which we have observed in the Agamoids are repeated here save the parachute-bearing Dragons, which have no pleurodont analogues. On the other hand, such types as the *Anoles*, with their digital expansions, and the semimarine algivorous *Amblyrhynchus* are unrepresented in the acrodont series. However, this apparent parallelism between the Agamoid and Iguanoid series of genera is very superficial, and there is, it appears to me, not one form so exactly repeated in both as to deserve to be united into the same genus were the character of the dentition, on which the family distinction is based, not to be considered.

The great majority of Iguanoids are insectivorous; *Iguana*, *Brachylopus*, *Amblyrhynchus*, *Conolophus*, *Phymaturus*, *Sauromalus*, *Basiliscus*, and *Dipsosaurus* are herbivorous, and the *Ctenosaura* are reported to be omnivorous.

Mr. J. Percy Moore¹ states that the *Liocephalus carinatus* of the Bahama Islands is carnivorous, "not even stopping at cannibalism," while from the stomach of an individual of the same species, also from the Bahamas, I took parts of flowers, with seed vessels and seeds; so that this form also is omnivorous.

Some species of *Sceloporus* and *Phrynosoma* are at present the only Iguanoids known to be ovoviparous.

With the exception of two genera occurring in Madagascar and one in the Friendly and Fiji islands, the range of this family is restricted to the New World.—(Boulenger.)

Systematic.—The elements composing the mandible may be fused at some points in certain genera, as may be discovered under the heads of the osteology of each. In Anolinæ the surangular is either wanting or is fused with the angular. On this ground I proposed at one time to separate this group from the remainder of the Iguanidæ as a distinct family, but the presence of similar variations in some genera of the latter makes it proper to abandon this course.

There are three distinct subfamilies of this family, which may be distinguished by characters of the skeleton. The first is characterized by the presence of numerous abdominal ribs, which do not connect with the sternum. This is the Anolinæ of the present work, and the Gastropleuræ of Wiegmann (1834). I have fortified this character by the discovery of the peculiarity of the left pulmonary mesentery, above mentioned. In the two other subfamilies the mesenteric characters are identical. In the Basiliscinæ the proximal extremity of the clavicle is expanded and perforated, as in the Teiidæ and other Leptogloss types. In the Iguaninæ it is simple. These divisions may be tabulated as follows:

Abdominal ribs; clavicle simple; a left hepatopulmonary mesentery.....	ANOLINÆ
No abdominal ribs; clavicle proximally looped; no left hepatopulmonary mesentery.....	BASILISCINÆ
No, or very few, abdominal ribs; clavicle proximally simple; no left hepatopulmonary mesentery	IGUANINÆ

¹ Proceedings, Academy of Natural Sciences, Philadelphia, 1896, p. 433.

The characters of the genera are as follows:

I. ANOLINÆ.

A. Nostrils above the canthus rostralis; digits more or less dilated or depressed, with smooth transverse lamellæ below. No femoral pores.

α. Distal joint of digits raised above the penultimate.

Lateral teeth, with subspherical crowns; palatine and pterygoid bones toothed *Chamaeleolis* Cocteau.

Lateral teeth tricuspid; tail prehensile..... *Xiphocercus* Fitzinger.

Lateral teeth tricuspid; tail not prehensile; no rostral appendage.

Anolis Daudin.

Like *Anolis*, but muzzle with a flexible appendage... *Scylomycterus* Cope.

αα. Distal joint not raised.

Digits scarcely dilated *Norops* Wagler.

AA. Nostrils below the canthus rostralis; digits not dilated, and with keeled lamellæ inferiorly. Femoral pores.

No gular fold nor dorsal crest; third and fourth toes equal.

Polychrus Cuvier.

II. BASILISCINÆ.

Toes with a free dermal border; back, tail, and head with compressed tegumentary crests supported by the skeleton; no femoral pores or large gular sac.

Basiliscus Laurenti.

Toes without free dermal border; no dorsal or caudal crest; skull produced horizontally behind; no femoral pores or large gular sac *Lamantius* Wiegmann.

III. IGUANINÆ.

A. Femoral pores absent (or a few present in the male of *Enyaliodes*; Boulenger).

1. Premaxillary teeth conical.

a. Infradigital lamellæ distinctly keeled.

a. Posterior part of head more or less produced. A gular sac; head with two ridges uniting posteriorly into an elevated bony crest.

Corythophanes Boie.

β. Head not produced posteriorly.

* One or more transverse gular folds, or a very large occipital (or interparietal) shield.

† Sternum without fontanelle.

‡ Body more or less compressed; a dorsal crest.

No abdominal ribs; no gular sac; no femoral pores,

Ophryocessa Fitzinger.

Abdominal ribs; male with a more or less developed gular sac and usually a few femoral pores..... *Enyaliodes* Boulenger.

‡‡ Body depressed.

A dorsal crest; toes denticulated laterally..... *Chalarodon* Peters.

No dorsal crest; toes compressed *Hoplurus* Cuvier.

No dorsal crest; toes depressed, denticulated laterally,

Pristidactylus Fitzinger.

†† A sternal fontanelle; occipital shield very large.

‡ Caudal scales small or moderately large.

Digits straight; no canine-like teeth..... *Tropidurus* Wiegmann.

Digits strongly bent at the articulations; anterior maxillary teeth longest *Uraniscodon* Kaup.

‡‡ Caudal scales very large and spinose.

No fold across the throat; tail subcylindrical... *Strobilurus* Wiegmann.

Two folds across the throat; tail flat *Urocentron* Kaup.

** No transverse gular fold; occipital shield small.

† A gular appendage.

Body compressed *Tropidodactylus* Boulenger.

†† No gular appendage.

‡ Males with anal pores.

Dorsal scales smooth and juxtaposed *Helocephalus* Philippi.

Dorsal scales keeled and imbricate *Liolaemus* Wiegmann.

‡‡ No anal pores.

§ Caudal scales forming verticils.

Abdominal ribs; dorsal and ventral scales large and keeled.

Scartiscus Cope.

No abdominal ribs *Stenocerus* Duméril and Bibron.

§§ Caudal scales not forming verticils.

No abdominal ribs; body slightly depressed; head-scales, small and keeled *Saccodaira* Girard.

Abdominal ribs; body more or less compressed *Liocephalus* Gray.

‡ Infradigital lamellæ smooth or indistinctly keeled.

α A transverse gular fold; no anal pores.

* Body, cylindrical or feebly compressed.

A slight dorsal crest or denticulation *Enyalus* Wagler.

No crest; dorsal scales uniform, granular,

*Urostrophus*¹ Duméril and Bibron.

** Body depressed; no dorsal crest.

Lateral teeth, tricuspid *Liosaurus* Duméril and Bibron.

Lateral teeth with obtuse and subspherical crowns.. *Diplolaemus* Bell.

β No gular fold; male with anal pores *Ctenoblepharis* Tschudi.

γ No gular fold; no anal pores *Aptycholaemus* Boulenger.

2. Premaxillary teeth, tricuspid.

Body much depressed *Phymaturus* Gravenhorst.

B. Femoral pores present.

1. Vertebrae with zygosphenal articulation.

* Premaxillary teeth, tricuspid.

A gular fold *Amblyrhynchus* Bell.

No gular fold *Conolophus* Fitzinger.

** Lateral teeth only, with denticulated crowns.

α. A more or less developed crest or row of enlarged scales on vertebral line.

β. No horny combs on posterior digits.

γ. A compressed denticulated gular pouch.

Body compressed; tail long with homogeneous pholidosis,

Iguana Laurenti.

γγ. Gular pouch, if present, not crested.

A gular pouch; tail long, not spinous *Brachylophus* Cuvier.

A gular pouch; tail spinous at base *Ctenosaura* Wiegmann.

A gular pouch; tail spinous to end. *Cachryx* Cope.

No gular pouch; a transverse collar; tail not spinous.

Dipsosaurus Hallowell.

ββ. Horny combs on some of the posterior digits.

A gular pouch; tail spinous at base *Cyclura*² Harlan.

αα. No dorsal crest of scales.

Superciliary scales segmental; tail without spines; a gular fold.

Sauromalus Duméril.

¹ Including *Anisolepis* Boulenger.

² Including *Metopocerus* Wagler.

2. Vertebrae without zygosphen.

* Posterior cranial borders not spinous.

† Superciliary and labial scales segmental.

Tail short, spinous; a gular fold..... *Hoplocercus* Fitzinger.

†† Superciliary scales imbricate; labials segmental.

A gular fold; occipital plate small *Crotaphytus* Holbrook.

A gular fold, with enlarged scales; occipital plate large,

Uta Baird and Girard.A gular fold without enlarged scales; occipital plate large. *Lysoptychus* Cope.No gular fold; occipital large *Sceloporus* Wiegmann.

†† Both superciliary and superior labial scales imbricate. (A gular fold.)

Tympanum exposed; occipital plate small; digits fringed. *Uma* Baird.

Tympanum exposed; occipital large; digits not fringed,

Callisaurus Blainville.

Tympanum concealed; occipital large; digits not fringed,

Holbrookia Girard.

** Posterior borders of cranium with bony spines. Two hepatoventral mesenteries.

Labial and superciliary scales not imbricate; occipital scale small; a gular fold; body short, depressed; ribs elongate.

Tympanic drum exposed..... *Phrynosoma* Wiegmann.Tympanic drum covered with scaly skin *Anota* Hallowell.

Twelve genera of this family enter the nearctic fauna. But one of these (*Sceloporus*) is found in its Eastern and Austroriparian districts, while four are found in the Central (*Sceloporous*, *Phrynosoma*, *Holbrookia*, *Crotaphytus*). The Pacific district includes four (*Sceloporus*, *Uta*, *Phrynosoma*, *Crotaphytus*); while the remaining genera belong to the Sonoran. Of these genera *Phrynosoma* and *Sceloporus* only occur in the Mexican district of the neotropical realm.

The geographical distribution of the genera is represented in the accompanying table:

The nearctic representatives of the Iguanidæ agree in possessing the following characters:

Tongue thick, fleshy, much depressed, attached firmly to the integument of the lower jaw, slightly free along the sides and at the tip only (not behind), which is sometimes free for one-fifth, sometimes scarcely at all; end of tongue generally slightly notched (not at all in *Anolis*), never bifurcated, and with two oval or triangular smooth disks beneath the tip, varying in size with the extent of freedom, the terminal notch being between these anteriorly and deeper as these are larger; tongue behind with a deep, wide notch, embracing the free end of the larynx, which is separated from the tongue proper by a depressed space (entrance in the notch); surface of the tongue uniformly and firmly papillose to the end; frenum of tongue single, median, and fleshy. Teeth always more or less compressed and three to five cusped posteriorly. Scales on the body rather small, generally subrhomboidal and arranged in slightly oblique series, more or less imbricated, most distinctly so anteriorly.

Eyelids present in all. Males distinguished from females by the plates behind anus larger than the rest. Scales on the back arranged on each side of a central dorsal series.

The superciliary scales are imbricate in front and sometimes behind, except in *Sauromalus* and *Anolis*, where they are serial or segmental.

The genera which enter the nearctic fauna may be compared as follows. They agree in the characters enumerated in the first paragraph.

Thighs with femoral pores; no preanal ones. Orifice of posterior nares much anterior to middle of palate. Digits more or less cylindrical; never partially expanded. Under surface of the digits generally in one series of transverse lamellæ, but these always have four or more ridges, forming conspicuous longitudinal series and imparting to each plate a strongly anterior serrated edge. Throat without longitudinal fold. A median mental plate.

A. Throat without any flat fold or collar. Head without spines.

Sceloporus.—Upper labials rectangular; not imbricated. No palatine teeth. Head covered with rather large, regular, plates, in definite series; the supraorbitals distinct. Side of neck with a short oblique fold overlapping a cavity lined with smaller scales. Scales above keeled, usually mucronate; all with more or less lateral denticulation. Sides of belly and usually chin with large blue patch, varied with black in males.

Lysoptychus.—Upper labials rectangular, not imbricate, and otherwise as *Sceloporus*. A loose fold of integument crossing gular region, without specialization of scales into a collar. Sides of neck plicate.

B. Throat with transverse folds, with marginal scales anterior to the breast. Head without spines. Sides of body usually with one lateral fold of skin. Sides of neck variously plicated. External ear wanting only in *Holbrookia*. Head covered with small, rounded plates in indefinite number, except in *Uta*.

(1) Upper labials rectangular, not imbricated nor oblique; outer face plane, and vertical, nearly round, or compressed, never much depressed; tail generally much longer than the head and body, except in *Sauromalus*; no black spots on sides, except in *Uta*; nostrils mostly lateral or supero-lateral.

α. With palatine teeth.

Sauromalus.—Tail shorter than the body, conical. Scales small but imbricated and angular throughout. Infraorbitals in a series of small, nearly equal plates. Plates above head numerous, all small; smaller in the outer part of supraorbital region. Posterior cheek teeth with five cusps. Claws very thick and strong, anterior larger.

Crotaphytus.—Tail much longer, slender, and rounded. Scales above, all about equal, small, rounded, not imbricated, and with much smaller ones between them. Supraorbital spaces with plates abruptly much smaller than the intermediate plates. Infraorbital plates small, nearly equal. Pallet beneath the tip of tongue large, ovate, very thin, sessile.

β. Without palatine teeth. A very long infraorbital.

Dipsosaurus.—Plates on head all very numerous, small, angular, nearly equal, and in indefinite number. Tail long and compressed. Body compressed. Scales on body rhomboidal. Body and tail with a single median dorsal series of much larger carinated, but not crested nor spinous, scales; the others on back and sides equal and smaller than the ventral.

Uta.—Plates on the head, including occipital and supraorbitals, rather large, angular, and in rather regular series of definite number. Dorsal scales carinated, imbricated, larger than the lateral, which are tessellated, but nearly equal to the ventral and, like them, lozenge-shaped or hexagonal. Tail rounded, longer than head and body. Sides of belly, blue.

(2) Upper labials lozenge-shaped, much imbricated and oblique; outer face with an oblique angular carina or else plane and vertical. Body depressed. Tail depressed, shorter than head and body. Nostrils superior. Sides of body or of belly, and generally the under surface of tail, with black patches. Ears distinct, except in *Holbrookia*. Lowest infraorbital much longest. No palatine teeth. Scales above nearly equal, much smaller than ventral. Claws long, nearly straight.

(a) Ears distinctly visible.

Uma.—Upper labials oblique, overlapping forward. Claws excavated on one side, turned forward, long, slender, and straight. Sides with a round black spot. A series of long scales movably articulated at the base to the external side of the hind foot.

Callisaurus.—Outer face of upper labials with a long, oblique, angular carina. Sides with black crescents; tail blotched beneath with black. Feet simple.

(b) Ears concealed.

Holbrookia.—Outer face of upper labials angular, as in the last. Interorbital space with a large central and a smaller irregular lateral scale on each side.

(c) Throat with distinct folds. Head with more or less prominent spines. Body broad and depressed, and with or without large spinous scales. Femoral pores.

Phrynosoma.—Labial scales quadrate, flat; those of the head small. Scales of back not uniform; those of belly uniform. Legs and tail short; a transverse gular fold.

ANOLIS Daudin.

Anolis DAUDIN, Rept., IV, 1802, p. 50.—MERREM, Tent. Syst. Amphib., 1820, p. 44.—FITZINGER, N. Classif. Rept., 1826, p. 17.—DUMÉRIl and BIBRON, 1837, IV, p. 85.—BOCOURT, Miss. Sc. Mex., Rept., 1873, p. 57.—BOULENGER, Erp. Gén., Cat. Liz. Brit. Mus., 1885, II, p. 11.

Anolius CUVIER, Règne Animal, II, 1829, p. 41.—GRAY, Cat. Liz., 1845, p. 199.

Xiphosaurus FITZINGER, N. Classif. Rept., 1826, and Syst. Rept., 1843, p. 67.—GRAY, Cat. Liz., 1845, p. 197.

Dactyloa WAGLER, Syst. Amph., 1830, p. 148.—WIEGMANN, Herp. Mex., 1834, p. 16.—FITZINGER, Syst. Rept., 1843, p. 66.—GRAY, Cat. Liz., 1845, p. 198.

Draconura WAGLER, Syst. Amph., 1830, p. 149.—WIEGMANN, Herp. Mex., 1834, p. 16.—FITZINGER, N. Classif. Rept., 1826, p. 69.—GRAY, Cat. Liz., 1845, p. 207.

Acantholis COCTEAU, Comptes Rendus, Paris, III, 1836, p. 226.—GRAY, Cat. Liz., 1845, p. 206.

Ctenonotus FITZINGER, N. Classif. Rept., 1826, p. 64; *Semiurus*, p. 64; *Microctenus*, p. 64; *Ptychonotus*, p. 65; *Istiocercus*, p. 65; *Eunotus*, p. 65; *Deiroptylx*, p. 66; *Trachycælia*, p. 66; *Ctenodeira*, p. 66; *Tropidopilus*, p. 66; *Eudactylus*, p. 67; *Heterolepis*, p. 67; *Trachypilus*, p. 67; *Pristicercus*, p. 67; *Ctenocercus*, p. 68; *Gastrotropis*, p. 68; *Heteroderma*, p. 68; *Dracontopsis*, p. 69.

Rhinosaurus GRAY, Cat. Liz., 1845, p. 199.

Antepenultimate joint of the toes flattened, expanded, and with imbricated transverse lamellæ. Throat with a long vertical compressed fold, capable of expansion into a fan; femoral pores wanting. Roof of mouth deeply and broadly excavated, with a narrow furrow on its posterior half, widening behind and abruptly in front opposite the internal nares. Tongue thick, fleshy, triangular, rounded in front, emarginate behind; nostril above the canthus rostralis.

The genus *Anolis*, as defined by Duméril and Bibron, embraces a great number of species, differing widely in external characters, which have been made the basis of generic and subgeneric characters by various authors, especially by Fitzinger. In general, the species may be distinguished into five groups. There are, first, those that possess a caudal fin in the male sex; a few large species and one or two small ones from the West Indies. Second, species with compressed tail, with caudal crest of scales, and with smooth ventral scales; a moderate number of species, chiefly from the West Indies, but several from Mexico and Central America. Third, species with tail like the preceding, but with keeled ventral scales; a few species characteristically West Indian. Fourth, species without median superior crest of scales on the tail, which is more or less round; ventral scales smooth; numerous species from South America, Central America, Mexico, and a very few from the West Indies. Fifth, tail like the last, ventral scales keeled; the major-

ity of the species, chiefly from Central America and Mexico, but a few West Indian.

The species inhabiting the United States belongs to the second section of the genus. In size it is intermediate.

The species of this genus are of arboreal habits, and they abound in the tropical parts of America, and there only. They run with great rapidity on the trunks and branches of trees, and dodge the pursuer with great ease. Their food consists of insects, and to a large extent of ants.

The *A. vermiculatus* of Cuba is said by Poey to dive into the water after insects from bushes on the shore. The species of *Chamaeleolis* have a good deal the appearance of chameleons, but the posterior cranial arches are not so elevated. All the species have wonderful powers of metachrosis, in which respect they quite equal the chameleons. Within the genus *Anolis*, which embraces 120 species, there is a great range of size and form. Thus the species *A. cuvieri* and *ricordii* of the Antilles and *edwardsii* of Jamaica reach a foot and more in length, while the *A. distichus* does not exceed 3 inches. The species *cuvieri* and *ricordii*, with the smaller *cristatellus* of the Virgin Islands, are peculiar in the possession of a caudal fin in the males, which is stretched on a frame composed of the neural spines of the vertebrae, as in the genus *Basiliscus*. This structure disappears so insensibly in the allied species that we can not sustain the genus *Dactyloa* Gray, proposed for such forms. In coloration the species display much beauty and variety. Thus, the *A. edwardsii* and *cuvieri* become a most vivid green under appropriate circumstances. The *A. heliactin* of Mexico is a golden yellow, and *A. pulchellus* of the Virgin Islands is also a metallic yellow. The *A. cyanopleurus* of Cuba is a brilliant blue, as is also the Haytian *A. caelestinus*. *A. loysianus* is of a kaolin white at times. The large *A. insignis* of Costa Rica displays delicate dove and fawn colors, mingled with more brilliant tints. The fans of the males are generally marked with pink, purple, blue, or golden spots.

Osteology.—The following osteological description is taken principally from the *A. carolinensis*, but other species which I have examined do not differ from it.

Premaxillary with long superior spine, and no inferior spine, but a notch. Nasals distinct, separated by premaxillary spine. Frontal and parietal bones each undivided, the pineal foramen on the coronal suture. Prefrontal large, not extending over orbit; lachrymal narrow, in contact with jugal. Postfrontal small, distinct; postorbital large. Supratemporal slender, forming the greater part of the supratemporal arch, its anterior extremity in contact with the postorbital and postorbital process of jugal bones. Paroccipital small; parietoquadrate arch well developed. Supraoccipital loosely attached, coossified with exoccipital.

The frontal bone is grooved on the median line below. The postoptics are within the epipterygoids, and are curved, inclosing a subcir-

cular space, and have a short external branch. The epipterygoid leaves the pterygoid behind the ectopterygoid process, and articulates with the parietal, passing some distance in front of the petrosal. The petrosal is very short above; the subforaminal process is distinct, and the inferior groove looks outward as well as downward. Quadrate with wide external conch and no internal conch. Stapes not deeply sunk; columella slender. The vomers are flat and elongate, and are not separated by a groove. The palatines are broad and flat, and the maxillo-palatine foramen is small. The pterygoids are broad and flat in front, and are then abruptly contracted from the outside to a narrow posterior part. This curves outward from the long basipterygoid processes to the quadrate. The ectopterygoids are short and are deflected at the proximal extremity. Presphenoid long and rodlike. Occipital condyle convex, simple, without exoccipital divisions.

The mandible has marked peculiarities. The Meckelian groove is closed, and the splenial bone, if present, is minute. I do not detect it in the *A. carolinensis*. There is a fossa on the inside of the ramus at the base of the coronoid. The latter bone is developed much anterior to its apex on the external face, and not posteriorly. The dentary is produced far posterior to the coronoid. The angular and articular are fused, and the angle is rather short and has an internal angular projection (*Xiphocercus valenciennii*, *Anolis equestris*, *A. marmoratus*, *A. carolinensis*).

The hyoid apparatus has the extreme development seen in all the lizards with a gular compressed pouch or fan. That is, the ceratobranchials of the second pair are closely appressed and produced to a great length. First pair of ceratobranchials and ceratohyals simple, the latter attached to the extremities of the moderately developed hypohyals.

The scapular arch conforms to the Iguanid type. There is a proscapula well above the coracoid, and a single coracoid notch. The sternum has a small median fontanelle which is reached by the long posterior limb of the interclavicle. Two ribs attached to each side of sternum, and three to each of the slender, closely appressed xiphoid rods. There are five pairs of abdominal ribs in *Anolis carolinensis*, and four, five, and six in other species.

The vertebræ have no zyosphen nor elongate diapophyses. There are eight cervical vertebræ, of which only the last four have ribs, all of which have simple heads, the last two being elongate and reaching to the plane of the sternum.

The caudal vertebræ have no supplementary dividing suture, and there is but one neural spine. The chevron bones are attached at the extremity of the centrum.

The pubes unite at an acute angle, and have well-developed pectineal process at the middle of their length. The ischia have a prominent tuber.

The premaxillary and anterior maxillary teeth are simple; the others are tricuspid.

Our single species is easily identified by the following characters:

Plates on head conspicuously carinated. Interorbital ridges continued between the nostrils to the end of snout. Nostrils more superior than lateral. Pallets distinct.

Dorsal and lateral scales all very small, the former gradually a little the larger; much smaller than the ventral. Obscure green *A. carolinensis*.

ANOLIS CAROLINENSIS Cuvier.

Anolis carolinensis CUVIER, Règne Animal, I, 1817, p. 43; 2d ed., II, 1829, p. 50.—DUMÉRIL and BIBRON, Erp. Gén., IV, 1837, p. 121.—DUMÉRIL, Cat. Coll. Rept. I, 1851, p. 57.—HOLBROOK, N. Amer. Herp., II, 1842, p. 67, pl. VIII.—COCTEAU, in R. de la Sagra, Hist. Cuba, Rept., 1843, p. 125, pl. XI.—HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1856, p. 232.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 43.—CATESBY, Nat. Hist. Carol., II, p. 55, pl. LXV.

† *Lacerta principalis* LINNÆUS, Syst. Nat., I, p. 360.

Anolis bullaris DAUDIN, part, Rept., IV, 1802, p. 69.

Anolis porcatus GRAY, Ann. Mag. Nat. Hist., V, 1840, p. 112.—GRAY, Cat. Spec. Liz. Coll. Brit. Mus., 1845, p. 201.

Anolius porcatus GRAY, Cat. Liz., 1845, p. 201.

Anolius principalis GRAY, Cat. Liz., p. 202.

Dactyloa (Ctenocercus) carolinensis FITZINGER, Syst. Rept., 1843, p. 68.

Anolis principalis BOCOURT, Miss. Sc. Mex., Rept., pl. xv, fig. 1.—SHUFELDT, Amer. Nat., XVII, 1883, p. 919.

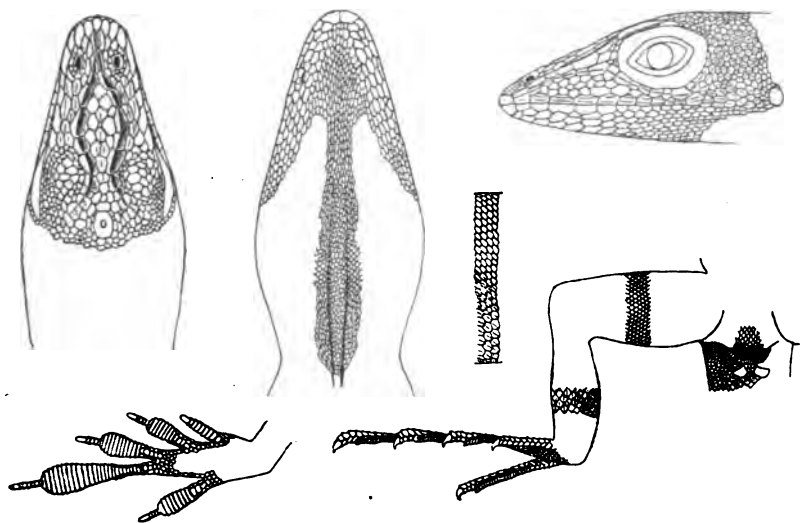


Fig. 16.

ANOLIS CAROLINENSIS CUVIER.

× $\frac{1}{2}$.

Collection of E. D. Cope.

Head lengthened, narrow, roughened above, and resembling that of an alligator. Two conspicuous crests of large angular plates, separated by two other rows, bordering the supraorbital space behind and

internally, and running forward distinctly between the nostrils. Nostrils more superior than lateral; inside of the *canthus rostralis*, which extends nearly to end of snout. Cephalic plates all longitudinally rugose or carinated. No crest on back or tail. Tail rounded. Scales on body and sides small, paved, slightly angular, and about equal; those of belly larger, oval, carinated. Large scales of the leg confined chiefly to the anterior surfaces.

Color green or brown above, whitish beneath. Cheeks with a long dusky spot. Upper parts sometimes blotched with dusky, as also occasionally the inside of legs. Chin with three dotted lines on each side interrupted anteriorly.

Head very large, forming nearly or quite one-third of the distance from snout to anus; much depressed and pyramidal; the sides plane, straight, and converging to near the rounded tip, and perpendicular to the plane upper surface. The width is about one-half the length to the ear. Nostrils entirely superior and internal to the *canthus rostralis*, opposite the junction of the first and second labial. Upper surface of head with ten ridges more conspicuous with age, which begin as a posterior and inner border to the supraorbital region, wider a little in front of this, and then converge until they meet between the nostrils. All the plates on the head large and longitudinally wrinkled. The cephalic ridges are composed each of about twelve plates, which, with a few intermediate ones, are the largest on the head. The supraorbital space exhibits five or six large plates in two series (the inner largest) and bordered internally by one row, externally by thirteen or fourteen of small tubercular plates. The *canthus rostralis* is formed by six sharp, long, imbricated plates; the side of the head below this to the labials is longitudinally excavated, the space occupied behind by five rows of nearly equal plates. The rostral is very broad, but low. There are 10 long, low, upper labials and about 11 lower; there is no median plate at the end of the lower jaw. The lower labials are margined by several series of elongated narrow plates, three or four anteriorly and a larger number behind, the third larger than the rest. All the other plates on the under surface of the head are small, elongated, tubercular, and paved. The scales are all small and nearly uniform on the back and sides, where they are tubercular, rounded, slightly carinated, but not imbricated. The belly scales are larger, more imbricated and rhomboidal, more carinated. The scales on the legs resemble those of the sides, except on the anterior faces when the limbs are folded and drawn up, where the scales are larger, imbricated, carinated, and acute. The scales on the tail are larger, strongly carinate, and in whorls. It is about twice the head and body, compressed and much attenuated, with a central series of larger scales along the upper edge. The hind leg brought forward reaches to the lower jaw; the hind foot is two-thirds the head, and is contained about four times in the head and body. It is about equal to the fore leg from the elbow. The fifth hind

toe is not quite as long as the second; the free portion of the longest is less than half the head. There are no crests along the dorsal line. There is a conspicuous longitudinal fold or flap of skin beginning about the middle of the chin and extending back sometimes over the entire chest.

I find a good deal of apparent variation in the proportions of the head, which sometimes seems to be shorter and broader than as described. I am, however, unable, with the series in hand, to find any other characters to correspond. As far as I can judge, the form with broader head is most abundant among specimens from the Mississippi Valley, those from the Atlantic States and Florida being as described above.

In the alcoholic specimen the color varies from light green to gray or brownish olive; greenish white beneath, sometimes brassy or bronzed, and palest about the pubic region. The edge of the upper jaw is whitish, the space behind the eye (sometimes before it) blackish. Beneath the head are several faint longitudinal lines (two or three on each side) of elongated spots, usually obsolete on the tip of the chin.

Sometimes there is an indistinct olivaceous yellow tinge along the back; the upper surfaces spotted with black, especially along this yellowish region.

Duméril and Bibron find no difference between the common *Anolis* of the Southern United States and one inhabiting Cuba, beyond the brighter colors and the absence of the dusky patch on the temples. On comparing pretty large series, however, I find that the cephalic plates of the Cuban animal are smoother and more regular, especially those on the side; the head more truncate anteriorly; the nostril apparently farther back; the scales on the fore part of back and, to a less extent, the body generally decidedly larger. The dilation of the toes is also more conspicuous. The cheeks, as stated, are without the brown patch.

The *Anolis carolinensis* is distributed from the Rio Grande to Florida, inclusive, and extends as far north as Kinston, North Carolina. It is, moreover, common in the Bahama Islands and Cuba, where it reaches a size rather superior to what is usual in the United States.

The following notes as to the food, habits, and color changes of *Anolis principalis* were made by Rev. S. Lockwood, who had a specimen under observation for a number of months.¹

It was observed that *Anolis* did not fancy beetles, but was fond of diptera or flies, while an occasional spider was taken with a relish. In capturing its prey, which was put alive into the fern case where the lizard was confined, the whole process was direct and neatly done, and the food secured without a bit of leaf or straw. Its cast-off skin, shed several times in one summer, was also invariably eaten, and even the bits that fell between the plants were carefully picked up.

¹ American Naturalist, X, 1876, p. 4.

Its two extremes of color are a deep, warm, bronzy brown and a pale but bright pea green. Throughout the day, although occasionally playing with diverse colors, it was for the most part brown, and this, too, although walking or nestling among green leaves. At night, when suspended, head up, from the posts at the corners of the fern case, it was invariably found to be a bright green.

Its change of color while basking in the sun is given in the following language:

Now begins that wonderful play of colors. It appears first in the normal bronze brown of the back. Literally they are lively colors, such are the moving changes, as the folds of the skin, especially those on the neck, catch the sunlight. That deep umber is now mellowing into a yellowish brown. A minute more and it has a bronze, coppery tint. Now it runs into an olive green; anon, a leek green; at last, a pale but bright pea green. Through all this color transformation there is on the back a medial line extending from head to tail which is always of a hue paler than all the rest. As to the under parts, the customary ashiness is all gone. It is white, not glaring, but soft. I think the tiny scales are set a little on edge, thus giving the white the aspect of frosted silver. Over the green of the back is a bloom, so that it looks like frosted green. The top of the flat head doggedly retains its dark, normal brown. * * * In ordinary repose the eyelids are pale brown, but these organs are equally susceptible of color change. Not only will they run rapidly through the whole scale, but the positive colors will be spread in decided and rapid contrast. These winking lids emulate the gems. Now a palish brown, they are smoky topazes. Instantly they become green emeralds, and, quicker than one can write, flash into the peculiar blue of the turquoise.

The delicate markings of very dark brown on the back and sides, made up of straight lines, zigzags, and chevrons, are constant, never changing their color.

Only twice during the summer did Mr. Lockwood's specimen exhibit the phenomena of inflating its throat. Then the colors of the dewlap were very fine, ending in a perfect flame of intense scarlet.

When the first sharp days of October set in, the lizard selected a hummock of dry sphagnum in the fern case, and with its nose worked a hole something after the manner of a toad while making its hole. This burrow was utilized for a sleeping place, and was occupied also on cold, dark days.

Anolis carolinensis Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4175	4	Pensacola, Florida.....	.....	Dr. R. W. Jeffrey.....	Alcoholic.
2987	3	Anderson, South Carolina.	.....	Mrs. M. E. Daniel.....	do.
2983	1	New Orleans, Louisiana.	.....	N. O. Academy.....	do.
11996	24	Georgiana, Florida.....	.....	William Wittfield.....	do.
10594	1	Clearwater, Florida.....	July 14, 1879	S. T. Walker.....	do.
10595	1	do.....	do.....	do.....	do.
10596	1	do.....	do.....	do.....	do.
10725	1	(?).....	do.....	do.....	do.
10724	1	(?).....	do.....	do.....	do.
11391	1	Milton, Florida.....	May 23, 1881	S. T. Walker.....	do.
10876	1	Oakley, South Carolina.	.....	.....do.....	do.
9490	1	(?).....	.....	.....do.....	do.
5144	1	Mississippi.....	.....	C. B. Adams.....	do.
9280	1	(?).....	.....	.....do.....	do.
9291	1	(?).....	.....	.....do.....	do.

Anolis carolinensis Linnaeus—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8335	2	Kingston, North Carolina.	.....	H. W. Welsher	Alcoholic.
5163	8	Louisiana .....	.....	C. B. Adams	do.
5158	3	Summerville, North Carolina.	.....	J. C. McNair	do.
5161	1	New Orleans, Louisiana.	.....	G. Wurdemann	do.
8305	1	Tocoi, Florida .....	.....	Prof. F. B. Meek	do.
4175	4	Pensacola, Florida .....	.....	Dr. R. W. Jeffrey	do.
9439	3	Micanopy, Florida .....	.....	Dr. J. H. Bean	do.
5160	7	Grand Couteau, Louisiana.	.....	St. Charles College	do.
5163	12	Louisiana .....	.....	C. B. Adams	do.
8903	2	Lake Monroe, Florida ..	.....	Prof. S. F. Baird	do.
5126	1	Eutaw, Alabama .....	.....	Prof. A. Winchell	do.
5124	6	New Orleans to Galveston, Texas.	.....	C. B. Adams	do.
8985	1	.....	.....	.....	do.
5088	1	North Carolina .....	.....	C. B. Adams	do.
5147	7	Cat Island, Wisconsin ..	.....	G. Wurdemann	do.
9440	4	Wisconsin .....	.....	.....	do.
5123	6	Charleston, South Carolina.	.....	.....	do.
5166	6	Kemper County, Mississippi.	.....	.....	do.
5218	1	Alabama .....	.....	W. M. Stewart	do.
4726	3	Micanopy, Florida .....	.....	Dr. J. H. Bean	do.
9965	2	Little Sarasota Bay, Florida.	— —, 1875	Prof. F. B. Meek	do.
11905	1	Nashville, Georgia	July 28, 1880	W. I. Taylor	do.
2988	1	Victoria, Texas .....	.....	Maj. W. H. Emory, U. S. A.	do.
11707	1	Camp Yuma, California ..	.....	R. O. Abbott	do.
10601	1	Middle Sound, North Carolina.	Apr. 18, 1880	R. E. Earl	do.
9265	1	Round Lake, Alabama ..	July 14, 1876	A. L. Kumllien	do.
14805	.....	Stanly County, North Carolina.	.....	John S. Webb	do.
15383-97	.....	New Orleans, Louisiana.	.....	Dr. R. W. Shufeldt	do.
15541	.....	Cook County, Texas .....	.....	G. H. Ragsdale	do.
15803	.....	Indian River .....	.....	G. Wurdemann	do.
17076	.....	Cameron County, Texas ..	.....	C. K. Worthen	do.
17696	.....	Neches River, 14 miles east of Palestine, Texas	.....	U. S. Fish Commission.	do.
18029	.....	Indian River, Miko, Florida.	.....	Dr. Geo. Marx	do.
19272	.....	Savannah, Georgia .....	.....	Prof. I. G. H. Kinberg ..	do.
19273	.....	do .....	.....	.....	do.
19274-5	.....	do .....	.....	Prof. I. G. H. Kinberg ..	do.
19799	.....	do .....	.....	C. W. Richmond	do.
19992	.....	Eustis, Florida .....	.....	U. S. Fish Commission.	do.
20031	.....	do .....	.....	do	do.
22343	.....	Orange Hammock, De Soto County, Florida.	.....	Wm. Palmer	do.
22345	.....	Lake Arbuckle, Polk County, Florida.	.....	do	do.

CTENOSAURA Wiegmann.

Ctenosaura WIEGMANN, Isis von Oken, 1828, p. 371.

Enyaliosaurus GRAY, Cat. Liz. Brit. Mus., 1845, p. 192.

The species of this genus are restricted to the Mexican and Central American regions as *Cyclura* is to the West Indian. The species known to me are six in number, as follows:

- I. Caudal whorls complete; dorsal crest extending only on the anterior dorsal region.
Tail round, whorls separated by one row of scales; brown, with a few black cross-bands on anterior dorsal region..... *C. hemilopha* Cope.
- II. Caudal whorls complete; dorsal crest extending to rump.
 - a. Caudal whorls separated by one row of scales.
Three scales on canthus rostralis; dorsal crest interrupted at rump; black or dark brown *C. multispinis* Cope.

aa. Caudal whorls separated by two or three rows of scales.

Head short, obtuse; three scales on canthus rostralis; dorsal crest interrupted at rump; black, with yellow cross-bands; sides of neck yellow.

C. brevirostris Cope.

Head wedge-shaped; three or four scales on canthus rostralis; all, except the posterior one, deeper than long; dorsal crest interrupted at rump; black, with yellow and green cross-bands and speckles.... *C. teres* Harlan.

Four canthal scales, the posterior longer than deep; head elongate, wedge-shaped; dorsal and caudal crests continuous at rump; tail compressed; green, with narrow black cross-bands to belly..... *C. completa* Bocourt.

III. Caudal whorls interrupted; each represented by a median dorsal spine and two on each side at the base.

Tail depressed, shorter; dorsal crest widely interrupted at rump; pale brown, with black cross-bands on anterior dorsal region.. *C. quinquecarinata* Gray.

The genus *Ctenosaura* includes species of large size, which inhabit the forests of the Central American region. In other parts of Neotropica they are unknown. In the West Indian region their place is taken by the genus *Cyclura*, while *Iguana* ranges almost the entire realm. One species enters the extreme limit of Neartica, at the southern part of the Lower Californian Peninsula, and one occupies the Plateau to southern Arizona.

The species are powerful and active, and can make a good defense when necessary by the use of their small sharp teeth and of their spinous tail. This organ is armed with rings of spinous scales, which are very acute, and which inflict considerable wounds when driven against the naked surface of the skin. In the smallest species, the *C. quinquecarinata*, the spines are especially large and are fewer in number than the other species, the form approaching the allied genus, *Cachryx* Cope. In the latter, of which the species are also Central American, the tail is abbreviated so as to be spinous to the end. In *Ctenosaura* the spines terminate a considerable distance cephalad of the distal part of the long slender tail.

These reptiles are valued as food by the natives of Central America, where they, like other large tree lizards, are called Iguanas.

CTENOSAURA HEMILOPHA Cope.

Ctenosaura hemilopha COPE, Proc. Acad. Nat. Sci. Phila., 1863, p. 105.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., 1885, p. 197.—VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, p. 88.

Iguana (Cyclura) acanthura BLAINVILLE, Nouv. Ann. Mus., IV, 1835, p. 288, pl. XXIV, fig. 1 (not of Shaw).

Cyclura acanthura DUMÉRIL and BIBRON, Erp. Gén. IV, 1837, p. 222.

Ctenosaura acanthura BOCOURT, Miss. Sc. Mex. Rept., 1874, p. 138.

Ctenosaura interrupta (DUGÈS) BOCOURT, Le Naturaliste, II, 1882, p. 47.

Breadth just anterior to the orbits equal to length from line connecting those points to end of muzzle. Rostral plate twice as broad as high, upper outline an arc. Seven premaxillary teeth; maxillaries (in one specimen) 21, of which six are conic, the third longest, and very few of the remainder more than tricuspid.

Scales on body very small, smaller on the back than on the belly; smooth. Dorso-nuchal crest extending to the sacrum in the male; not beyond the anterior two-thirds of the back in the female; not continuous with caudal. Tail depressed at the base, above with alternate rings of large spinose and small smooth scales; only the first four whorls of spines separated from one another by two or three series of smaller scales; the spines on the vertebral line strong and forming a crest, but

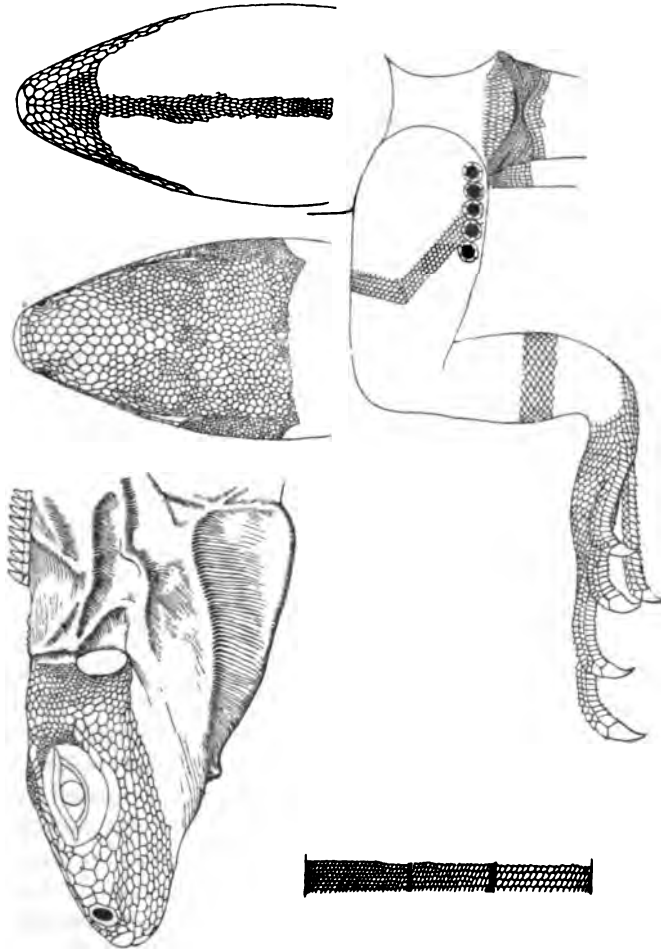


FIG. 17.
CTENOSAURA HEMILOPHA COPE.
× 3.

La Paz, Lower California.
Cat. No. 19852, U.S.N.M.

less developed than those on the sides; scales on lower surface of tail narrow and keeled, each segment, beginning from the seventh, composed of only two rings of scales. Five femoral pores. Olive gray or green above, sides, sacral region, and limbs with fine dark-brown network; back with darker crossbands, of which a narrow one between the shoulders and two broader ones behind it are black; lower surfaces whitish; lower lip with vertical dark-brown bars, throat marbled

with brown, belly and lower surfaces of limbs with round dark-brown spots. Foot short, sole not spinous.

Length from end of muzzle to gular fold, 160 mm.; from mastoid to mastoid, 75 mm.; from edge of fold to vent, 435 mm.; vent to end of tail, 825 mm.; posterior extremity, 333 mm.

Cyclura hemilopha Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
5295	4	Cape St. Lucas, L. California.	.....	J. Xantus	Alcoholic type.
12651	1	La Paz, L. California....	Feb. —, 1882..	L. Belding	Alcoholic.
12652	1	do	Feb. —, 1882..	do	do.
21460	.....	(?) .....	(?) .....	(?) .....	do.

This species was known to De Blainville as long ago as 1835, and he gives a figure of it. He and Bocourt, in his fine work on the reptiles of Mexico, regarded it as the *Lacerta acanthura* of Shaw.¹ This can not be correct, as Shaw distinctly states that the dorsal crest of his species extends to the rump. It is probably one of the species of the next section (II) of the genus, but which one I am unable to ascertain.

CTENOSAURA MULTISPINIS Cope.

Ctenosaura multispinis COPE, Proc., American Philosophical Society, XXIII, 1885, p. 267.

Head elongate, flat above, muzzle narrowed; nostril in the second third of the length to the orbit. Three scales on canthus rostralis, each deeper than long. Seven flat scales across muzzle between anterior angles of orbits. Two rows between supraorbital series. Scales above temporal muscles rather large, weakly keeled. Five series of infralabial plates, not separated by smaller ones. Dorsal crest rather elevated in adult, terminating at the rump. Median caudal crest composed of conical scales, beginning above the posterior margin of the femora. Tail cylindrical at base, covered by whorls of prominent scales with conical points which project strongly and which are separated by one row of smaller flat scales on the upper half of the tail. On the inferior side of the tail the whorl rows are separated by two intervening rows, which are just like them, having a keel and a mucronate apex. Beyond the middle of the length (end lost) the tail is strongly compressed, but whether this due to shriveling on drying I am not sure. Median series of spinous scales uninterrupted. The abdominal scales are larger than the dorsal, which are longer than the lateral scales; all are subquadrate, and none are keeled.

Seven femoral pores. Color, above and below, black.

Measurements.—Length from end of muzzle to vent, 255 mm.; length to line of axilla, 125 mm.; length to line of auricular meatus, 62 mm.; width

¹ Zoology, III, 1806.

of head at auricular meatus, 42 mm.; width of head above auricular meatus, 35 mm.; length of anterior limb, 93 mm.; length of anterior foot, 37 mm.; length of posterior limb, 150 mm.; length of posterior foot, 76 mm.

I have before me two stuffed specimens of this species, a large one and probably adult, and a smaller and younger one, which I described above. This is No. 201 of Sumichrast's collection, and was procured by him at Dondomingvillo, in the State of Oaxaca, and sent to the Smithsonian Institution. The other specimen was obtained near Batopilas, Chihuahua, by Mr. Edward Wilkinson, and was recorded by me as *Cyclura acanthura* in the catalogue of his collection.¹ It agrees with the type specimen in having the distal two-thirds of the tail strongly compressed. The dorsal crest is much less elevated, probably owing to its younger age. The colors are paler, the prevailing tint being light brown with indistinct darker brown cross bands. More recently a specimen was sent to the U.S. National Museum from Nogales, a town which stands on the line between Arizona and Chihuahua. The species is clearly to be included in the area of the Columbian Realm.

I find a specimen of this species, enumerated as Var. B of *Ctenosaura acanthura* by Boulenger.²

Ctenosaura multispinis Cope.

Catalogue No.	Number of specimens.	Locality.	Collector.
17178	1	Nogales, Arizona.....	P. L. Jouy.

DIPSOSAURUS Hallowell.

Dipsosaurus HALLOWELL, Proc. Acad. Nat. Sci. Phila., VII, 1854, p. 92.—BOCOURT, Miss. Sc. Mex. Rept., 1874, p. 146.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 201.

A gular fold. Sides of neck wrinkled. Dorsal and ventral scales more or less imbricated, all distinctly rhomboidal, or lozenge-shaped, and in nearly transverse series. Tail much longer than body; much compressed. Back with a crest of a single series of larger, strongly carinated, but not spinous scales. Femoral pores. Nostrils terminal, entirely lateral, anterior to end of canthus rostralis. Palate not toothed, the portion between the posterior nares scooped out. Tongue arrow-shaped, slightly bifid, with two large elliptical, sessile pads. Teeth pleurodent, all compressed, and strongly 3-lobed, even the anterior ones.

But one species of this genus is known. It is of interest as approaching more nearly in its characters the large arboreal types of tropical America than any other which enters our fauna.

Osteology.—The osteology of this genus presents a number of inter-

¹ Proceedings, American Philosophical Society, XVIII, 1879, p. 261.

² Catalogue of Lizards in the British Museum, II, p. 197.

esting peculiarities which constitute difference from *Crotaphytus*, to which its general appearance suggests affinity.

Premaxillary bone with elongate superior spine and posterior emargination of inferior face. Nasals large, distinct, not shortened in front, since the nostrils open forward. Frontal narrow, entire, grooved on the middle line below, its posterior region pierced by the pineal foramen, which is entirely anterior to the coronal suture (*D. dorsalis*). Supraoccipital loosely articulated anteriorly, and not distinct from exoccipitals. Prefrontals large, not extending over orbit; lachrymal smaller, touched by jugal. Postfrontal small, distinct from the large postorbital. The latter articulates extensively with both the jugal and supratemporal. Paroccipital small. Parietoquadrate arch well elevated. The vomers together as broad as long, not produced posteriorly, with a median fossa. Palatine flat, with a short maxillary process; pterygoid flat in front, concave on the inner side behind for contact with the long basipterygoid process. Ectopterygoid decurved at its inner extremity. Quadrate with a narrow internal and a wide external conch. Postoptic an open sigmoid, reaching frontal above, with a median expansion with rudiment of posterior limb. Petrosal very short above; subforaminal portion prominent, with a wide inferior groove looking downward. Epipterygoid leaving pterygoid behind ectopterygoid process, and reaching parietal without contact with petrosal. Presphenoid rudimental; sphenoid and basioccipital united, and with prominent lateral edges. Occipital condyle with exoccipital elements feebly distinguished.

In the mandible the Meckelian groove is completely curved. The coronoid has little horizontal extent, and that is principally anteriorly on the external side. The surangular and articular are fused together, and the splenial is small. The dentary extends as far posteriorly as the posterior border of the coronoid. The angle is prominent, flattened so as to be horizontal, and has an internal angle.

The scapula has a large proscapula directed upward, and the coracoid has one emargination, which is large. The sternum has a narrow median fontanelle which is not covered by the interclavicle. There are four pairs of ribs articulated to the sternum, and two continue into the approximated xiphoid rods. The ribs reach the sacrum.

Vertebrae with a zygosphen articulation. Eight cervical vertebrae, the anterior with a compressed hypapophysis, which soon becomes a keel, which is absent on the eighth cervical and all following vertebrae. Four anterior vertebrae without ribs; seventh and eighth with long ribs. Diapophyses very short, except in the caudal region, where they are present for half its length, increasing in length to the base, where they are quite elongate. Chevron bones intercentral. Neural spines of dorsal region low; of caudal region rather elevated, oblique, and preceded by a compressed vertical prominence or anterior neural spine. The centra are transversely segmented just in front of the diapophysis, except in the anterior part of the series.

The angle of junction of the pubes is nearly right, and the pectineal

process is median, short, and decurved. The ischia have a long, common suture, and are deflected downward, meeting at less than a right angle. Tuber a prominent angle. The ilium presents a short subacute angle, representing the *crista*. There is a deep posterior notch of the acetabulum.

In *Dipsosaurus dorsalis* all the teeth on the maxillary bone are tricuspidate; those on the premaxillary are mostly simple, but one or two external ones show a rudimental lateral cusp.

In the only known species the colon is well developed, and the small intestine is elongate. Its habits are herbivorous, as I have taken remains of flowers from their stomachs.

DIPSOSAURUS DORSALIS Baird and Girard.

Dipsosaurus dorsalis HALLOWELL, Proc. Acad. Nat. Sci. Phila., VII, 1854, p. 92; Rept. U. S. Expl. Surv., XIII, Pt. 4, p. 7, pl. vi, fig. 1.—BAIRD, U. S. Mex. Bound. Surv., Herp., 1859, p. 8, pl. xxxii, figs. 7-13.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 146.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., 1885, II, p. 201.—VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, p. 92.

Crotaphytus dorsalis BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 126.

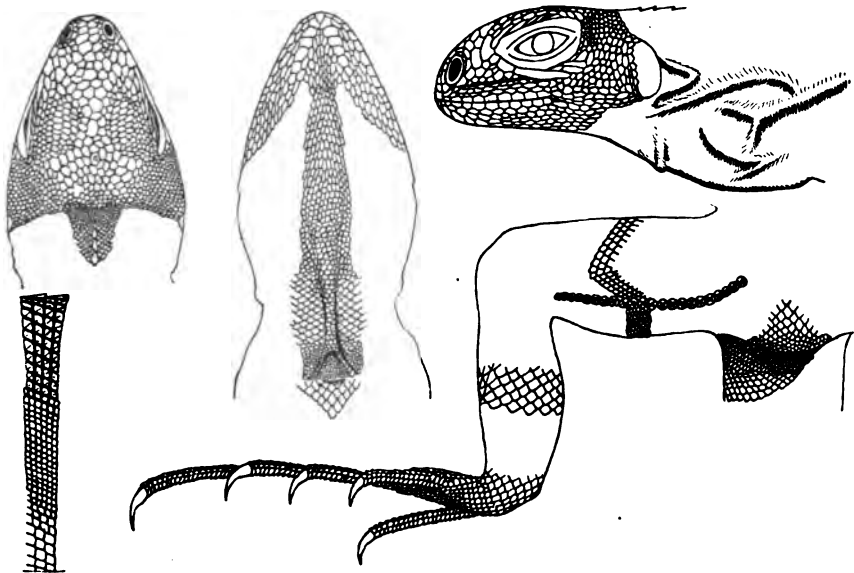


Fig. 18.

DIPSOSAURUS DORSALIS BAIRD AND GIRARD.

× ½.

Fort Yuma, Arizona.

Cat. No. 2730, U.S.N.M.

Head small, scarcely as wide as the neck, or more than half the length of hind foot; rather longer than broad; muzzle blunt; forehead sloping very rapidly. A single gular fold. The scales on the chin large, granular, and nearly even. A conspicuous ridge on the back from head to middle of tail, formed of a single series of scales larger

than elsewhere, each scale conspicuously keeled. The other scales above about equal, slightly reticulated and diamond-shaped, each one with a slight keel. Scales on the belly similar, but larger; those on the sides smaller than either. Scales on the tail keeled, on the belly smooth. Tail compressed; about twice as long as the body. Auditory aperture vertically elongated, with the anterior edge dentated. Infra-orbital chin composed chiefly of one single horizontal plate. Femoral pores distinct in the adult male.

Head very short, not one-fifth the length from snout to anus. Hind foot not quite two-fifths this length. Tail twice as long. It is readily fractured, differing in this respect from the species of *Crotaphytus*, where it is quite tough.

General color in alcohol brownish yellow, the sides and legs marked with lines of brownish red, which anastomose to a greater or less extent and inclose rounded or polygonal yellowish blotches, which are less distinct on the back; the under part generally yellowish; the tail with an alternation of nearly equal yellowish and brownish rings interrupted below.

In young specimens there are two blackish spots above each shoulder. The side of the head is barred vertically with bluish, the chin and throat faintly blotched with the same. The orbits are dusky, with a yellow bar at each end of the eye.

This species ranges from Cape St. Lucas along the gulf coast of Lower California to the Colorado and Mohave deserts. To the east it extends at least as far as the Colorado River, but how far beyond is not known. Its northern range is indicated below.

In regard to the habits of *Dipsosaurus dorsalis*, Dr. Merriam remarks¹ as follows:

This remarkable lizard is more strictly limited to the torrid Lower Sonoran Zone than any other species, not excepting the gridiron-tail (*Callisaurus ventralis*). It ranges across the Lower Sonoran deserts of the Great Basin from the Mohave Desert and Death Valley to the Great Bend of the Colorado River, and thence northerly in eastern Nevada through the lower part of the valleys of the Virgin and Muddy, always keeping within the *Larrea* belt. In western Nevada it reaches its northern limit in the Amargosa Desert, and was not found in Oasis Valley or Indian Spring Valley. In the northwest arm of Death Valley it does not range northward beyond Grapevine Canyon, and in Owens Valley was not found much north of the lake. It is a strict vegetarian, feeding on buds and flowers, which it devours in large quantities. No insects were found in any of the stomachs examined; some contained beautiful bouquets of the yellow blossoms of *Acacia*, the orange *Malvastrum*, the rich purple *Dalea*, and the mesquite (*Prosopis juliflora*); others contained leaves only.

¹North American Fauna, No. 7, 1893, p. 164.

Dipsosaurus dorsalis Hallowell.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimens.
2730	1	Fort Yuma, California	— —, 1855	Maj. G. H. Thomas, U. S. A.	Alcoholic.
9374	1	Colorado and Zubi Expedition	.....	.....	do.
9373	3	Colorado River	.....	H. Mollhausen	do.
2702	1	Pacific R. R. Survey	.....	Lieut. R. S. Williamson, U. S. A.	do.
9295	1	Sonora	.....	.....	do.
8635	1	Colorado Desert, Arizona	— —, 1875	Lieut. E. Bergland, U. S. A.	do.
12634	6	La Paz, Lower California	— —, 1882	L. Belding	do.
12653	2	do	— —, 1882	do	do.
5294	12	Cape St. Lucas, Lower California	.....	J. Xantus	do.
4178	1	Colorado	.....	A. Schott	do.
15888-91	.....	San Luis, Gozales Bay, Gulf of California.	.....	U. S. Fish Commission.	do.
15066-68	.....	Yuma, Arizona	.....	do	do.
19103	.....	Colorado Desert, south of Salton Lake, California.	.....	F. Stephens	do.
21728	.....	Quitovaquito, Mex. Bound. Line, Arizona.	.....	Dr. E. A. Mearns	do.
21829	.....	Fort Yuma, California	.....	do	do.
21854-5	.....	Yuma Desert; mon. 200, Arizona.	.....	do	do.
21950-1	.....	Coyote Wells, Colorado Desert, San Diego County, California.	.....	do	do.
21952	.....	Gardiners Laguna, Salton River, Lower California.	.....	do	do.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	Date.	Collector.
			Feet.		
18345	Male adult.	Callville, Great Bend of Colorado, Nevada	.....	May 4	Merriam.
18346	Young	do	.....	do	Bailey.
18347	juv.	do	.....	do	do.
18348	Adult	Amargosa Desert, Nevada	.....	May 31	Merriam.
18349	juv.	Amargosa River, California	.....	Apr. 27	Bailey.
18350	juv.	do	.....	do	Merriam.
18351	Adult	Three miles east of Owens Lake, California	4, 100	June 26	Bailey.
18352	Adult	Panamint Valley, California	3, 300	May 15	Nelson
18353	Adult	do	.....	Apr. 24	Bailey.
18354	Adult	Mohave Desert, Leach Point Valley, California	.....	Apr. 25	Merriam.
18355	Adult	Borax Flat Water Station, California	2, 100	Apr. 22	Stephens.
18356	Adult	Mesquite Valley, California	.....	Apr. 13	Bailey.
18357	Adult	Bennett Wells, California	.....	Apr. 1	do.
18358	Adult	do	.....	Apr. 4	do.
18359	juv.	Furnace Creek, Death Valley, California	.....	June 21	Fisher.
18360	Adult	Owl Holes, Death Valley, California	.....	Apr. 26	Merriam.

CROTAPHYTUS Holbrook.

Crotaphytus HOLBROOK, North Amer. Herpt., II, 1842, p. 79.—BAIRD and GIRARD, in Stansb. Expl. Gr. Salt Lake, 1852, p. 339.—BOCOURT, Miss. Sc. Mex. Rept., 1874, p. 153.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 203.

Leiosaurus A. DUMÉRIL, part, Arch. Mus., VIII, 1856, p. 532.

Throat and sides of neck wrinkled; a gular fold; femoral pores. Scales above small, tuberculate, and paved; beneath larger, imbricated, and hexagonal. Tail much larger than body, rounded. Head covered with scales above. Occipitals small; suborbitals of small plates. Ear distinct. Nostril rather lateral, anterior to the end of *canthus rostralis*.

Tongue arrow-shaped, slightly notched at tip; where it is free as at the sides, the tip beneath with two ovate disks. Palatine teeth. Cheek teeth compressed, with three-lobed crown behind; conical anteriorly; the bases apparently in a shallow groove; the space between the bases of the teeth filled up partly with bone.

Osteology.—The skeletons of the two most abundant species are before me, namely, the *C. collaris* Holbrook and *C. wislizenii* Baird and Girard. The following description includes both, and if any differences between the two exist, they are mentioned.

The premaxillary has a long spine above and a concave border behind on the palate, from which projects forward a pair of juxtaposed processes which together form a button-like process which has an anterior free border. The nasals are wide and shortened by the removal of their anterior border on account of the large size and partly vertical direction of the nostrils. Frontal single, narrow; pineal foramen touching coronal suture, in the frontal bone in *C. collaris* and in the parietal in *C. wislizenii*. Prefrontal large, with a prominent preocular boss, not extending posteriorly over the orbit. Lachrymal small, in line with and touching the jugal. Postfrontal wanting; its place taken by a process of the frontal. Postorbital large, uniting exteriorly with jugal and supratemporal. Parietoquadrate arch elevated; supraoccipital bone loosely articulated, not distinct from exoccipital. Quadrate with rather flat conchs, the external the larger, and with straight external border. Postoptics not reaching frontal, curved, with short posterior branch. Petrosal with prominent subforaminal portion, which has an open groove looking downward. Vomers short and wide, not separated by a groove. Palatines flat, with short maxillary process. Pterygoids rather narrowed by the large palatine foramina; posterior part grooved and receiving basiptyergoid processes. Ectopterygoids depressed internally. Epiptyergoid originating behind ectopterygoid process, and reaching parietal without contact with petrosal. Presphenoid rudimental; sphenoid and basioccipital confluent. Occipital condyle plain, with exoccipital elements not distinct. The fenestra ovalis and foramen of eighth nerve sunk in deep fossæ.

In the mandible the terminal part of Meckel's cartilage is exposed. The coronoid has no extension on the external face, and extends a short distance forward on the inner face. The splenial is rather elongate, and extends anterior to the splenial foramen. The dentary extends to the line of the posterior border of the coronoid above and of its anterior border below. In old individuals the surangular and articular are fused. The angle is pinched, and sends inward a horizontal process similar to its posterior process.

In the hyoid apparatus the ceratobranchials of the second pair are closely appressed, thus supporting a median gular angle. The hypohyals are moderately long, and they join by their extremities the ceratohyals, which have no expansions and are of only moderate length.

The scapula has a well-developed proscapula, and there are two deep emarginations of the coracoid. The sternum has a narrow longitudinal median fontanelle in the *C. collaris*, and no fontanelle in *C. wislizenii* (one specimen of each examined). There are four ribs articulating directly with the sternum on each side, and two by means of each xiphoid rod. The latter are not closely appressed as in some, nor so widely separated as in other Iguanidæ.

Vertebrae without zygosphenal articulation, but the prezygapophyseal faces concave. Cervical vertebrae eight, the anterior five vertebrae with six free intercentra in *C. wislizenii* and four vertebrae with five intercentra in *C. collaris*; anterior three vertebrae without ribs in both species. The neural spines are very low on the dorsal vertebrae, and are a little more elevated on the caudals. The latter have a projecting keel toward the anterior part in the *C. wislizenii* (wanting in *C. collaris*), which represents the anterior neural spine of *Dipsosaurus dorsalis*. The centra in *Crotaphytus* are not segmented. Diapophyses are present, but are nowhere long. Short ribs extend to the sacrum.

The teeth are tricuspid, but in the two species examined the lateral cusps are rudimental. Anterolateral and incisor teeth simple, subequal. The pubes unite at an exceedingly open angle, and the pectineal process is submedian. Tuber ischii prominent, a small angle, or crista ilii. Acetabulum entire posteriorly.

The principal characters in which the skeleton of the *Crotaphytus* differs from *Dipsosaurus* are the following: Nasal bones shortened in front; no postfrontals; pineal foramen connected with coronal suture; Meckelian canal partly open; two notches of coracoid; xiphoid rods not appressed; no zygosphen; caudal centra not divided; acetabulum not deeply notched.

There is a small median posterior lobe of the liver. The left lobe is larger than usual in this family, so as to cause a deep excavation of the posterior border. The colon is not so large as in *Dipsosaurus*, and there is no cæcum. The small intestine is rather long.

The species of this genus are insectivorous. I have taken fragments of grasshoppers from the stomachs of both *C. collaris* and *C. wislizenii*.

Interorbital scales in one or two rows; other scales above head larger. Under surface of fore and hind feet with the scales large, carinated, and mucronate. Infra-orbital chain in a series of six or eight subequal scales.

Scales on the gular fold equal to those below the fore legs. General color greenish or grayish; the back thickly spotted with whitish (in alcoholic specimens; red perhaps in life). A double black collar on each side the neck. Chin bluish or green, reticulated with yellowish. Young with the large rounded or sub-polygonal dark blotches in an ashy ground; the back and tail marked with transverse bars of whitish..... *C. collaris*.

Scales on the gular fold much smaller than those between the fore legs. General color above grayish, with a hexagonal reticulation of lighter. The interstices here and there abruptly dark brown, a trace only of a black collar on the neck in a single specimen. Chin and throat reticulated. No light spots. *C. reticulatus*.

Interorbital scales in three or four rows (rarely in two rows). Other scales on head above small. Infraorbital chain composed of a single large plate, with one or two small ones at each end. Under surface of feet with small and generally almost smooth scales.

Scales on gular fold as large as those between the fore legs. General color brownish yellow, with large, dark, rounded spots, the intervals usually sprinkled or dotted with red (whitish in spirits); the tail and generally the back with a succession of transverse light bands. The chain broadly streaked longitudinally with bluish, without any trace of reticulation. The light dots sometimes wanting, and, to a greater or less extent, the dark spots; the ground color then being dark *C. wislizenii*.

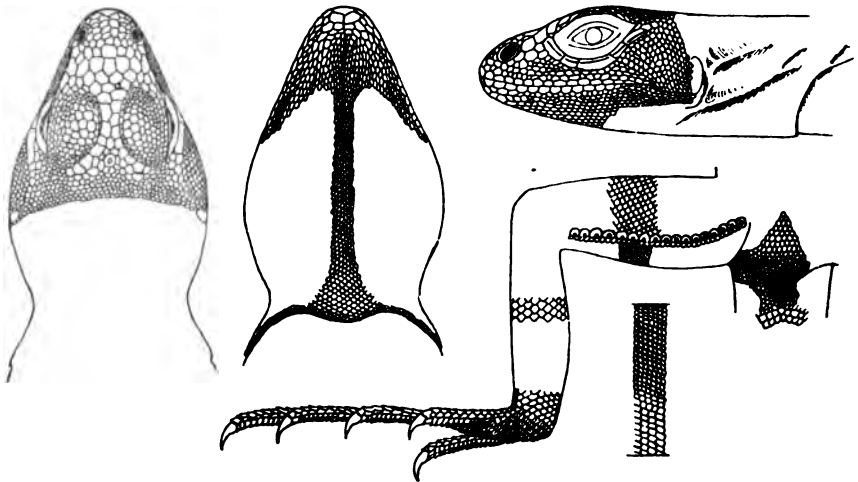


Fig. 19.

CROTAPHYTUS COLLARIS SAY.

× ½.

Lake Valley, New Mexico.

Collection of E. D. Cope.

CROTAPHYTUS COLLARIS Say.

Crotaphytus collaris HOLBROOK, N. Amer. Herpt., II, 1842, p. 79, pl. x.—BAIRD and GIRARD in Marcy's Red River, 1843, p. 235.—HALLOWELL, Proc. Acad. Nat. Sc. Phila., VIII, October, 1856, p. 238; December, 1856, p. 309.—WIED, Nov. Act. Ac. Leop.-Car., XXXII, 1865, p. 58.—BAIRD, Rep. U. S. Expl. Surv., XIII, Pt. 3, 1857, p. 17, pl. xxiv, fig. 1; U. S. and Mex. Bound. Surv., 1859, p. 6.—COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 302.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 154, pl. xvii bis, figs. 5, 6.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 203.

Agama collaris SAY, Long's Expd. Rocky Mts., II, 1823, p. 252.—HARLAN, Med. Phys. Res., 1835, p. 142, pl., fig. 4.

Liosaurus collaris A. DUMÉRIL, Arch. Mus., VIII, 1856, p. 533, note 1.

Head very broad, its width fully equal to the distance from snout to ear. Supraorbital plates abruptly smaller than those on the middle and front of head. Of these there are two rows (sometimes one row)

between the middle orbits, and about seven between their anterior extremities; about six between the nostrils. Infraorbital plates nearly equal in a chain of about eight. Scales on anterior border of ear subacutely tubercular, prominent. Sometimes two scales of the suborbital series are fused, as in the specimen figured. Scales of gular fold as large as those between the fore legs. Scales on belly subhexagonal and imbricated; on the back smaller, rounded, tubercular, and not larger along the median line. Femoral pores about twenty-two. Scales on the under surface of hands and feet larger, conspicuously carinated and mucronate; on the hinder part of the tail moderately so; elsewhere the scales smooth. Upper parts of a variable shade of dark green or bluish; the thighs, back, and sides marked pretty regularly and closely with rounded or oblong light spots, which on the lower part of back and tail above exhibit a tendency to transverse light bands. The upper part and sides of head, the tibia, and tail marked with similar dark spots. Two half rings of black, extending across the back between the insertion of the fore legs, each bordered by yellowish. Under parts yellowish-white, tinged in specimens with greenish, especially between the fore legs; the chin and throat green or blue (sometimes nearly black), and quite regularly reticulated with yellowish.

The double black half collars are very constant; sometimes the anterior is interrupted above and the branches extended forward; this also seen sometimes in the posterior one. Both begin on the shoulders, and are seldom, if ever, connected below.

The colors of this species vary exceedingly. In life the light spots, especially in young specimens, are of various shades of red, orange, yellow, white. In the young the light dorsal spots exhibit a great tendency to arrangement in transverse bands, more or less continuous. The embryonic coloration appears to be a reticulation on the back and sides of grayish or light ashy, the meshes rather large, and inclosing blackish rounded, scarcely polygonal spaces, arranged transversely; the back, with a succession of whitish (or perhaps reddish) bars at intervals. Of these there are about ten from head to tail, while on the tail they are much closer and even more regular, forming some forty to fifty half rings. The black collars, and the blue and yellowish reticulations on the chin are very distinctly marked. The light caudal rings are scarcely ever visible in the adult (where, on the contrary, the darker interspaces become more prominent) and but rarely the light dorsal bands; the light reticulation of the back becomes broken up with the light spots already mentioned.

Sometimes the ground color is much lighter than that described, the under parts being quite pure whitish in alcohol, the upper light ashy olive.

In one specimen (Cat. No. 2721), the throat, upper part of breast, and the flanks are indigo black, very strongly marked. The tail appears unusually compressed.

Cat. No. 2732, from Chihuahua, has a series of large rounded dark spots on each side behind the fore leg, and the supraorbital plates are flatter than usual. Cat. No. 2768, from the Colorado River, also shows the spots to less extent, but there is not the same difference in the orbital plates. The specimens are not in sufficiently good condition to furnish satisfactory indications on other points.

Dr. Stejneger has pointed out¹ that specimens of this species from the Sonoran region always possess two series of frontal scales, while those from the Central region and the Texan district present generally but one row. He states, also, that the specimens which enter the former category have smaller supraocular scales, a narrower head, and a longer muzzle. He regards these as belonging to another species, which he calls *C. baileyi*. He observes, further, that "there can be no doubt that both forms are subspecies of the same species, but whether the form now named for the first time should receive a trinomial appellation or not is quite another thing, depending, according to the code of zoological nomenclature adopted by the American Ornithologists' Union, which I adhere to in all my writings, on whether the two forms are now known to intergrade or not." Stejneger then goes on to observe that, "In the collection before me there are a few specimens which present features which at first sight might seem to indicate intergradation," and he points out three specimens of an intermediate character so far as regards the character of the frontal scales.

My examination of the series in the national collection has convinced me of two things—first, that the differences observed by Dr. Stejneger exist, and are mainly characteristic of distinct geographical areas, and, second, that the transitions are so numerous that a distinct specific appellation is not practicable, and that even a distinct subspecific name is of doubtful utility. In arranging the specimens I set apart three lots—first, those presenting two rows of frontal scales (*C. baileyi*); second, those with one row, and, third, those bottles which contain specimens, mostly from the same localities, of both kinds. Of the first lot there are thirty-six specimens, in the second twenty-two, and in the third twenty-two. The proportion of specimens which do not show geographical limitation of range, it will be observed, is equal to those of the typical *C. collaris*, which do so. Let us now analyze the characters of these two lots. In lot second, six specimens exhibit two rows; eleven have one scale only which crosses the frontal region; four have two scales which cross, and one has three scales. In lot third (*C. collaris* typical), four have one scale across the entire frontal bone; seventeen have two scales, and one has three scales so extending. It seems, then, of specimens in which the series of two scales is interrupted, that in fifteen one scale crosses the frontal space; in twenty-one two scales cross, and two have three scales crossing. Thus we find that the character of the frontal scales is variable, since there are fifteen specimens

¹ North American Fauna, No. 3, 1890, p. 103.

intermediate between the two forms to thirty-six typical of the one, and twenty-four of the other. The bottles in which specimens of different character occur are Cat. Nos. 2715, 2725, 8468, 8465, 12762, and are from near the Canadian River; from Santa Fe, New Mexico; the Rio Grande, Texas, etc., mostly localities intermediate between the ranges of the two forms. In my own collection, in three specimens from Fort Worth, in Texas, all the interorbital scales are divided but one in one, and all are divided in three specimens. In three, from near San Antonio, two scales cross in one specimen, one crosses in one, and none in one.

The superorbitals are rather large in typical forms of the *C. collaris* from the central region, as stated by Stejneger, but variability is seen in these specimens quite as often as occurs in the frontal scaled. The same form has the widest head, but this character is still less constant than the others, the Sonoran form presenting the greatest variations in this respect.

I found this species common in the rocks and open woods of the plateau country from near San Antonio to Mason County, north of Llano River, or as far as my observation extended. In the northern part of the State, according to Boll, it first begins to be abundant near Weatherford, longitude $97^{\circ} 50'$, and extends westward. This gentleman has never seen it in the cretaceous region of Fort Worth and Dallas. I found it abundant in rocky ground along the eastern front of the Llano Estacado as far north as Miami and northward to Fort Supply, Oklahoma. In the east it extends north to southwest Missouri in the Ozark region; also in northwest Nevada as far north as Pyramid Lake. Dr. J. L. Wortman obtained it for me on the Bruneau River, in southern Idaho, its most northern station yet known. It runs very swiftly, carrying the tail over its back, like *Holbrookia texana* and various other iguanian lizards. In its manners it is perhaps the most pugnacious of our lizards, opening its mouth when cornered, and biting savagely. Its sharp teeth can do no more than slightly cut the skin.

Crotaphytus collaris Say.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8468	4	Santa Fe, New Mexico..	June 22, 1873	Dr. C. G. Newberry....	Alcoholic.
8472	1	do	July —, 1874	H. W. Henshaw	do.
8474	1	San Ildefonso, New Mexico.	Aug. —, 1874	Dr. H. C. Yarrow	do.
8544	7	Fort Union, New Mexico	— —, 1875	Peter Connell	do.
4757	4	Fort Riley, Kansas	— —, 1874	H. Brandt	do.
7814	2	do	— —, 1864	Dr. B. J. D. Irwin, U. S. A.	do.
2766	3	Fort Bliss, Texas	— —, 1871	Dr. S. W. Crawford, U. S. A.	do.
5046	1	Fort McKavett, Texas..	— —, 1871	Captain Plummer	do.
2733	1	Western Texas	— —, 1871	Dr. S. W. Woodhouse..	do.
5179	2	Fort Stockton, Texas..	— —, 1871	P. Duffy	do.
8295	1	Bonito Cañon, Arizona..	— —, 1871	Gen. W. F. M. Army ..	do.
8467	1	Apache, Arizona	Aug. 27, 1874	Dr. O. Loew	do.
8463	1	do	Aug. 8, 1874	Dr. C. G. Newberry....	do.
8466	1	do	Aug. —, 1874	Dr. O. Loew	do.
8465	1	Arizona	Aug. 1, 1874	Dr. C. G. Newberry....	do.
8158	1	do	— —, 1871	F. Bischoff	do.

Crotaphytus collaris Say—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8114	1	Dome Cañon, Nevada		Dr. H. C. Yarrow	Alcoholic.
4726	3	Chihuahua, Mexico		Dr. J. B. Bean	do.
2768	2	Colorado River		Lieut. J. C. Ives, U. S. A.	do.
5058	1	Southern Utah		J. A. Snyder	do.
4363	4	Upper Colorado River		Lieut. J. C. Ives, U. S. A.	do.
9370	3	California		H. B. Mollhausen	do.
9369	1	Pesqueira Grande, New Leon, Mexico.	Apr. —, 1853	Lieut. B. Couch, U. S. A.	do.
2725	1	Los Nogales, Rio Grande		Dr. C. B. R. Kennerly	do.
2701	2	Fort Smith, Arkansas		Lieut. A. W. Whipple, U. S. A.	do.
9368	1	Verdigria River, Arkansas.		Lieut. B. Couch, U. S. A.	do.
2694	1	Western Sonora		Maj. W. H. Emory, U. S. A.	do.
2728	1	Sta. Caterina, Mexico		Lieut. B. Couch, U. S. A.	do.
5062	3	Carson's Pass, Utah		C. McCarthy	do.
2695	1	Near 38° longitude		Lieut. E. G. Beckwith, U. S. A.	do.
8628	1	Camp Mohave, Arizona.	Aug. —, 1875	William Somers	do.
8629	1	California	— —, 1875	Dr. H. C. Yarrow	do.
9549	1	Mohave Desert, California.	— —, 1874	Dr. O. Loew	do.
2732	1	Chihuahua, Mexico		John Potts	do.
11733	2	Truckee River, Nevada.	July —, 1867	R. Ridgway	do.
11860	3	Camp Whipple, Arizona	— —, 1865	Dr. E. Coues, U. S. A.	do.
11889	1	Camp Supply, Indian Territory.	— —, 1870	Dr. J. E. Wilcox, U. S. A.	do.
11733	5	Truckee River, Nevada.	July —, 1867	Robert Ridgway	do.
11860	2	Camp Whipple, Arizona	— —, 1865	Dr. E. Coues, U. S. A.	do.
2694	3	Red River, Arkansas		Capt. R. B. Marcy, U. S. A.	do.
2738	2	(?)		Capt. John Pope, U. S. A.	do.
2688	2	Near 38° longitude		do.	do.
4771	1	Fort Riley, Kansas		H. Brandt	do.
8471	1	Santa Fe, New Mexico	June —, 1873	H. W. Henshaw	do.
2715	5	Near Canadian River		H. B. Mollhausen	do.
12762	2	Tehuacana, Texas		Wm. Hudson	do.
14748		Fort Huachuca, Arizona		Benson	do.
19704-7		do		Wilcox	do.
22206		Camp Verde, Arizona		Loring	do.
22207		Fort Bowie, Arizona		Fisher	do.
22208		Fort Huachuca, Arizona		Loring	do.
16807		Nogales, Arizona		P. L. Jouy	do.
15658		Oak Creek, Verde River		Capt. W. L. Carpenter	do.
15689-92		Prescott, Arizona		do.	do.
16761		Fort Wingate, New Mexico.		Dr. R. W. Shufeldt	do.
17181-3		Nogales, Arizona		P. L. Jouy	do.
19342-49		Mexican boundary line		Dr. E. A. Mearns	do.
21956-60		Mountain spring, east slope, Coast Range, San Diego County, California.		do.	do.
22129		Pinal Mountains, foothills, Arizona.		Herbert Brown	do.
22268		Las Cruces, New Mexico		Dr. T. D. A. Cockerell	do.
14804		Austin, Texas		W. C. Burns	do.
14814		Fort Verde, Arizona		Dr. E. A. Mearns	do.
15325				do.	do.
15709-10		Fort Verde, Arizona		Capt. W. L. Carpenter	do.
22131-2		Irondale, Washington County, Missouri.		Julius Hurter	do.
22315					do.

Crotaphytus collaris Say—Continued.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	Date.	Collector.	Remarks.
(1)	(1)	Fort Huachuca, Arizona.....	Feet.		T. Wilcox, U. S. A. Merriam...	
18319	Male...	Diamond Valley, Utah, 10 miles north- west of St. George.	4,800	May 16	Merriam...	On lava rock.
18320	Female...	do.....	4,800	do	do	do.
18321	Female...	do.....	4,800	do	do	do.
18322	Female...	Oasis Valley, Nevada.....		June 1	do	
18323	Male...	Desert Mountains, Quartz Spring, Nevada.	5,000	May 28	do	
18324	Male...	Juniper Mountains (25 miles east of Panaca), Nevada.	6,200	May 28	Bailey....	In junipers.
18325	Male ¹ ...	North Kingston Mountains, Nevada..		April 28	do	
18326	Male ¹ ...	do.....		do	do	
18327	Male...	White Mountains, Deep Spring Val- ley Slope, California.	5,600	June 9	Merriam...	
18328	Female...	do.....	5,600	do	do	
18329	Male...	Emigrant Cañon, California, Pana- mint Mountains.	4,600	do	Stephens	
18330	Male...	Inyo Mountains, California.....	5,000	May 17	Nelson....	
18331	Female...	Death Valley, 5 miles from Bennett Wells, California.		Mar. 25	Fisher....	
18332	Male...	Coso Valley, near Maturango Spring, California.		May 11	Palmer....	
18333	Male...	Argus Range, Shepherd Cañon, Cali- fornia.		April 27	Fisher....	
18334	Female...	do.....		do	do	
18335	Female...	do.....		do	do	
18336	Male...	Argus Range, Maturango Spring, California.		May 3	do	
18337	Male...	Argus Range, Searl's Garden, Cali- fornia.	2,000	April 28	Stephens	
18338	Male...	Panamint Mountains, Willow Creek, California.	4,500	May 19	Nelson....	
18339	Male ¹ ...	do.....	4,500	do	do	
18340	Female ¹ ...	do.....	4,500	do	do	
18341	Female...	Panamint Mountains, Mill Creek, California.	4,900	May 15	do	
18342	Male ¹ ...	Panamint Mountains, Surprise Cañon, California.		April 23	Fisher....	
18343	Male...	Panamint Mountains, 3 miles above Wild Rose Spring, California.	5,000	April 16	Stephens	
18344	Male...	do.....	5,000	do	do	

¹ Adult.

Dr. C. H. Merriam¹ gives the following account of the habits of *Crotaphytus collaris*:

The "ring-necked" lizard does not inhabit the *Larrea* belt of the Lower Sonoran zone, but is common in suitable places in the Upper Sonoran, whence it descends a short distance into the *Grayia* belt. It lives among rocks, frequently in canyons, and is commonest in the desert ranges. In the Panamint Mountains, California, it was found in Surprise Canyon, in Emigrant Canyon, just above the *Larrea* (altitude, 1,400 meters, or 4,600 feet). In the White Mountains it was secured in the canyon leading from Deep Spring Valley up over the pass (altitude, 1,700 meters, or 5,600 feet), and also high up on the west slope, always among rocks, and Mr. Nelson collected it in the Argus Mountains and in Coso Valley. In Nevada it was rather common on the west slope of the Charleston Mountains below Mountain Spring, and was found also in Oasis Valley, at Quartz Spring, at the west part of the Desert Mountains (altitude, 1,520 meters, or 5,000 feet); Utah (altitude, 1,830 to 2,040 meters, or 6,000 to 6,700 feet), and in the upper part of Pahranagat Valley.

In Utah a very dark form was found in company with a black form of *Sceloporus biserialis* on the black lava rock in Diamond Valley, between St. George and the Upper Santa Clara crossing.

¹ North American Fauna, No. 7, 1893, p. 165.

The *Crotaphytus collaris* ranges from southern Missouri through central Kansas to northern Nevada as its northern limit; to Texas, as far as the mouth of the Rio Grande; to the city of Chihuahua and to south-eastern California, to the Sierra Nevada, beyond which it has not yet been found. Stejneger,¹ remarks as to its distribution in this direction:

In spite of the fact that this species, in certain localities at least, ascends the mountains as high as 5,600 feet, it does not occur anywhere within the interior valley of California, nor does it pass beyond the San Bernardino range; in fact, it does not seem to reach the coast anywhere; it is evidently an inland desert form.

CROTAPHYTUS RETICULATUS Baird.

Crotaphytus reticulatus BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 253.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 203.

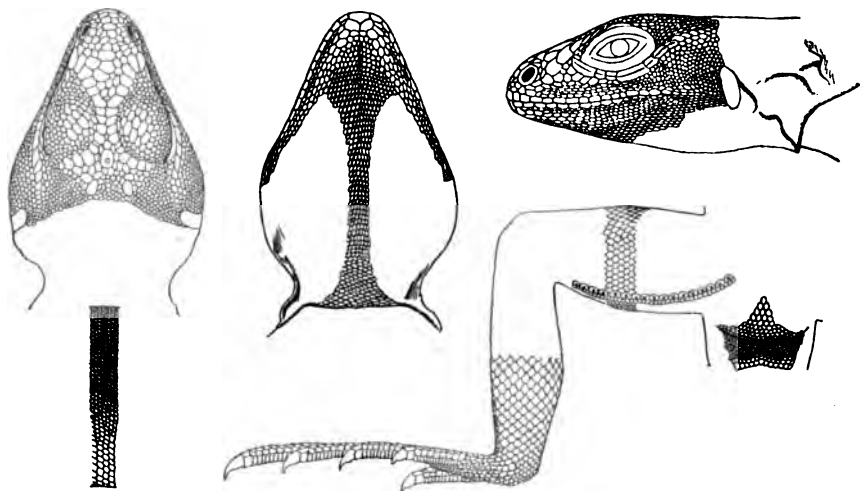


Fig. 20.

CROTAPHYTUS RETICULATUS BAIRD.

× 2.

Ringgold Barracks, Texas.

Cat. No. 2692, U.S.N.M.

External characters those of *C. collaris* as to width of head, large size of plates, division of suborbitals into a series of 6 or 8 nearly equal plates. The scales on the chin and throat, however, are much smaller, those on the gular fold scarcely imbricated, and considerably less than those between the fore legs, instead of the same size, as in *C. collaris* and *wislizenii*. Scales on the inferior surface of legs carinated; mucronate rather smaller than in *C. collaris*. Scales of the head, and especially those on the border of the auditory meatus, less tubercular than in *C. collaris*; hence no serrate on border.

General color in spirits, brownish gray; entire upper and outer surfaces of head, body, limbs, and tail covered by a network of light ash,

¹ North American Fauna, No. 7, 1893, p. 165.

the meshes quite regularly hexagonal, covering eight to twelve scales in width, and here and there abruptly dark brown, instead of the pale ground color. The chin with somewhat similar reticulations in one specimen, in another the web coarser. The rest of the under parts throughout are yellowish. In a female specimen with inconspicuous femoral pores there is no trace of a collar on the neck as in *collaris*. In a male with the pores very large and black there is a dull blackish collar on the throat passing around the sides of the neck, but interrupted above the middle of throat is bluish. There are no indications whatever of white spots, as in *collaris*.

This species is quite similar in form to the *C. collaris*, but differs in the smaller gular and less prominent auricular scales. Its coloration is entirely different, lacking the double interrupted collar on the neck and the white spots. Any approach to the reticulation described is never seen in *collaris*, except in very young specimens, and then much more irregular and combined with transverse light bands not found in *reticulatus*.

This handsome species continues rare, the four specimens below mentioned being the only ones that have come under my observation.

Crotaphytus reticulatus Baird.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2731	2	Laredo, Texas .....	.....	Maj. W. H. Emory, U. S. A.	Alcoholic.
2692	2	Ringgold Barracks, Texas .....	.....	.....	do.

CROTAPHYTUS WISLIZENII Baird and Girard.

Crotaphytus wislizentii BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, April, 1852, p. 69 (New Mexico); Stansbury Rept. G. Salt Lake, 1852, p. 340, pl. III, and in Mex. Bound. Surv. Rept., 1859, p. 7, pl. XXXI.—BOCOURT, Miss. Sc. Mex. Rept., 1874, p. 155, pl. XVII bis., fig. 4.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 204.

Crotaphytus gambelii BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, August, 1852, p. 126.

Crotaphytus fasciatus HALLOWELL, Proc. Acad. Nat. Sci. Phila., VI, December, 1852, p. 206; Sitgreaves Rept. Zuffi, 1853, p. 115, pl. v (same description as preceding).

Leiosaurus hallowellii AUG. DUMÉRIL, Arch. Mus., VIII, 1856, p. 533, note 1.

Crotaphytus copei YARROW, Proc. U. S. Nat. Mus., V, 1882, p. 441.

Crotaphytus silus STEJNEGER, North American Fauna, No. 3, 1890, p. 105; No. 7, Pt. 2, 1895, p. 170.

Head narrow; its width scarcely two-thirds the distance from snout to ear. Supraorbital plates only moderately smaller than those in the middle and front of head. Of these plates there are three or four series between the middle of the orbit and eleven or twelve between their anterior extremities. Infraorbital chain composed of one long plate, and one or two short ones at either end, about eight between the nos-

trils. Scales on belly subhexagonal; on the back smaller, rounded, tubercular, and not larger along the middle line. Scales of gular fold as large as those between the fore legs. Femoral pores about 18. Scales on the under surface of the feet hard and smaller; only obsoletely carinated or quite smooth; on the dorsal surface of the tail behind obsoletely keeled; elsewhere smooth. Tail about twice the body; hind foot about two-fifths the body; no dark collar; general color a brownish yellow, with rather obsolete circular and pretty large blotches distributed pretty uniformly over the back and sides of head and body and exposed surfaces of the legs, the interspaces finely dotted with yellowish (on single scales). The tail is ringed alternately with brown and yellowish, the brown rings forming two blotches on each

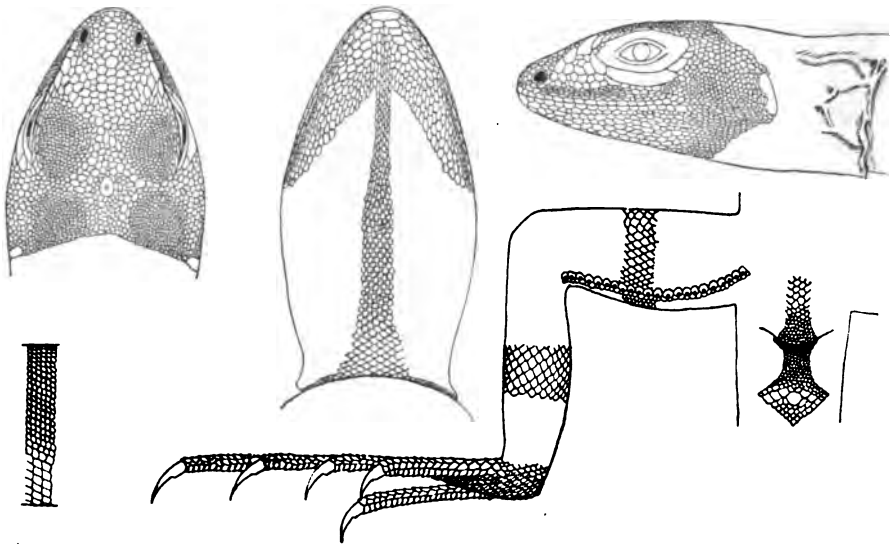


Fig. 21.

CROTAPHYTUS WISLIZENII BAIRD AND GIRARD.

× 4.

San Bernardino, California.

Collection of E. D. Cope.

side, generally separated narrowly above (sometimes confluent), but more or less confluent obsoletely below. The under parts are yellowish, the chin with broad longitudinal stripes of obsolete bluish (not reticulations).

Sometimes the whitest dots are disposed so as to constitute an indistinct reticulation with the large rounded blotches in the meshes. There are generally two dorsal series of these blotches much larger than the others. There are usually more or less faint traces of transverse light bars on the back, especially toward the base of the tail, and sometimes on the flanks; in young specimens distinctly traceable as far as the head.

In younger specimens, the light spotted reticulation is more continu-

ous, and in fact confluent. It is then generally of an ashy gray color (in alcohol), embracing large dark rounded or oval spots. Sometimes the ground color is ashy, with distant rounded spots. The yellow transverse bands are very conspicuous, eight or ten from head to tail, and about forty on the tail. The supraorbital region is generally faintly margined internally with yellowish. An external margin extends to the nostrils. There is a yellow band across the snout anterior to the nostrils and continuous with a yellow edge of the upper lip; this sends back a short branch between the nostrils. There is also a short yellow line from behind the eye. The chin is always streaked longitudinally with bluish.

With a large series of specimens before me I must confess my inability to separate the *C. gambelii* of Baird and Girard from *wislizenii*, the supposed differences not being constant. The absence of the light spots was the chief character of the type specimen, the greater size of the scales being due to its larger dimensions than the type of *wislizenii*.

The *Crotaphytus fasciatus* of Hallowell (type No. 2736) is precisely identical with the *gambelii* type, having very conspicuous transverse bands. The white dots of typical *wislizenii*, however, are very distinct.

Dr. Stejneger has separated those individuals from California as a distinct species under the name of *C. silus*.¹ The sole definition given is the following:

"Similar to *C. wislizenii*, but with the snout much shorter and more truncate in profile; greatest width of head equal to or greater than distance from nostril to ear opening; distance between nostril and inner anterior orbital angle considerably less than vertical diameter of ear opening."

Were the above characters constant they would not alone characterize a species of lizard, and examination of the series in the national collection shows that they are not constant nor correlated with any other character. I find a more reliable peculiarity of the Pacific representatives of the *C. wislizenii* to be the character of the scales of the palm and sole, in which it resembles the two species already described, *C. collaris* and *C. reticulatus*. This character, however, fades out and grades into the typical condition, even in Californian individuals. Thus specimens with palm and solar scales keeled are Cat. Nos. 8157, 9581, 11757, 11790, and 12663. The keels are not so strong in Cat. Nos. 2685, 2717, and 2722. They are wanting in Cat. Nos. 8632 and 14195; all from the Pacific region. Specimens taken by myself near Pyramid Lake, Nevada, have the subdigital scales keeled and mucronate. The ground color is dark, and it is crossed by light orange crossbars, which inclose subquadrate areas. In one specimen these areas tend to be broken up into large oval spots. In the type of *C. copei*, from the southern part of Lower California, the subdigital lamellæ are equally carinate and mucronate, and the quadrate color areas consist of from six to nine round spots.

¹North American Fauna, No. 3, 1890, p. 105.

We have here, then, a tendency to the formation of a race, which is not sufficiently pronounced to have produced a subspecies.

The *Crotaphytus wislizenii* belongs to the fauna of the Great Basin division of the central region, ranging into the northern part of the Sonoran and into the southern part of the Pacific. I found it common as far north as Pyramid Lake, in northwest Nevada, and Dr. Wortman sent me specimens from the Bruneau River, in southwest Idaho. It does not range nearly so far east as the *C. collaris*, not passing, so far as known at present, the Pecos River of Texas.

This is a very active species, and is more or less carnivorous in its habits. I took from the stomach of one a fully grown *Uta stansburiana*.

Crotaphytus wislizenii Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2770	1	Colorado.....	.....	H. Mollhausen	Alcoholic type.
2736	1	Dona Ana, Mexico.....	.....	Capt. L. Sitgreaves, U. S. A.	Alcoholic; type of <i>fasciatus</i> .
2722	1	California .....	.....	Dr. W. Gambel.....	Alcoholic; type of <i>gambeli</i> .
8080	15	Dome Canyon, Nevada..	— —, 1872	Dr. H. C. Yarrow.....	Alcoholic.
8157	1	Arizona	— —, 1871	Dr. W. A. Hammond, U. S. A.	do.
5064	1	Pecos River, Texas .....	.....	.....	do.
4274	1	Laguna, New Mexico .....	.....	Lieut. J. C. Ives, U. S. A.	do.
8475	1	Santa Fe, New Mexico..	July —, 1874	H. W. Henshaw	do.
4930	1	Southern Utah.....	.....	Dr. C. Brewer	do.
2720	3	Near 32° L.....	.....	Lieut. E. G. Beckwith, U. S. A.	do.
2717	3	California .....	.....	Lieut. R. S. Williamson, U. S. A.	do.
9371	1	.....	.....	.....	do.
2608	6	Near 38° L.....	.....	Lieut. E. G. Beckwith, U. S. A.	do.
9372	2	.....	.....	Col. J. D. Graham, U. S. A.	do.
2765	3	Salt Lake to California..	.....	J. S. Bowman	do.
9516	4	Pyramid Lake, Nevada..	May —, 1877	H. W. Henshaw	do.
8632	1	Southern California	— —, 1875	J. A. Hasson	do.
9581	2	Near Fort Tejon, California.	— —, 1863	W. M. Gabb	do.
2685	1	Sonora.....	.....	Col. J. D. Graham, U. S. A.	do.
11757	1	Fresno, California	— —, 1879	Gustav Eisen	do.
11771	4	Camp 12, Nevada	— —, 1867	Robert Ridgway	do.
11730	2	Truckee River, Nevada..	July —, 1867	.....	do.
11833	2	Old Fort Cobb, Texas .....	.....	Dr. E. Palmer	do.
11790	5	Fresno, California	— —, 1879	Gustav Eisen	do.
12663	.....	La Paz, Lower California	.....	L. Belding	Alcoholic; type of <i>C. cooperi</i> .
11790	7	Fresno, California	— —, 1879	Gustav Eisen	do.
11811	2	(?) .....	.....	.....	do.
11935	1	Camp Mohave, Arizona..	— —, 1877	Dr. R. E. Lightburne	do.
11859	1	Camp Whipple, Arizona	— —, 1865	Dr. E. Cones, U. S. A.	do.
11730	3	Truckee River, Nevada	July —, 1867	Robert Ridgway	do.
11757	2	Fresno, California	— —, 1879	Gustav Eisen	do.
11771	3	Camp 12, Nevada	— —, 1867	R. Ridgway	do.
10621	1	(?) .....	.....	.....	do.
10620	1	(?) .....	.....	.....	do.
10622	1	(?) .....	.....	.....	do.
15736	.....	Valture, Arizona .....	.....	Stajner	do.
15820	.....	Little Colorado, Arizona	.....	Merriam & Bailey	do.
15821-27	.....	Painted Desert, Lower California, western Arizona.	.....	do.....	do.
16856	.....	Mountains, northern Lower California	.....	C. R. Orcutt	do.
16504	.....	Colorado Desert, California.	.....	do.....	do.
16968	.....	Tucson, Arizona .....	.....	P. L. Jouy	do.
17190	.....	do.....	.....	do.....	do.

Crotaphytus wislizenii Baird and Girard—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
15617-18		St. Thomas, Nevada.		Dr. E. Palmer	Alcoholic.
16807		Nogales, Arizona.		P. L. Jouy	do.
16851		Colorado Desert, San Diego County, California.		C. R. Orcutt	do.
16856		Mountains, northern Lower California.		do.	do.
16968		Tucson, Arizona.		P. L. Jouy	do.
17150		do.		do.	do.
19104		Colorado Desert, south of Salton Lake, California.		F. Stephens	do.
19350-51		Mexican boundary line		Dr. E. A. Mearns	do.
21477		Snake River bottoms, near Bliss, Idaho.		U. S. Fish Commission	do.
21856-57		Yuma Desert, Mon. 200, Arizona.		Dr. E. A. Mearns	do.
21953		Gardners Laguna, Salton River, Lower California.		do.	do.
21954		New River, Colorado Desert, San Diego County, California.		do.	do.
21955		Coyote Wells, Colorado Desert, San Diego County, California.		do.	do.
22130		Gila River, Gila County, Arizona.		do.	do.
22267		Las Cruces, New Mexico		Dr. T. D. A. Cockerell	do.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	Date.	Collector.	Remarks.
			<i>Feet.</i>			
18258	Male	St. George, Utah		May 13	Bailey	
18259	Male	10 miles northwest of St. George, Utah.	4,800	May 16	do	
18260	Male	Mountain Meadows, Utah		May 17	Merriam	
18261	Female	do		do	do	
18262	Female	do		do	do	
18263	Female	do		do	do	
18264	Female	Panaca, Nevada		May 19	Bailey	
18265	Male	Vegas Valley, Nevada		May 2	do	
18266	Female	Tule Canyon, Mount Magruder, Nevada		June 5	Merriam	
18267	Male	Quartz Spring, Nevada		May 28	do	
18268	Male	Amargosa Desert, Nevada		May 31	do	
18269	Male	Sarcobatus Flat, Nevada	4,600	June 2	Bailey	
18270	Female	East foot of Charleston Mountains (Cottonwood Springs), Nevada	4,800	Apr. 30	do	
18271	Female	Grapevine Mountains, Nevada	4,800	June 10	Nelson	
18272	Male	Timpahute Mountains, Nevada		May 26	Bailey	
18273	Female	do		do	do	
18274	Female	Indian Spring Valley, Nevada		May 28	Merriam	
18275	Female	do		May 29	do	
18276	Female	Pahrump Valley, Nevada		Apr. 29	Bailey	
18277	Male	do		do	do	
18278	Male	do		Apr. 28	Merriam	
18279	Male	Pahrangat Valley, Nevada		May 23	Bailey	
18280	Female	do		May 25	do	
18281	Female	Pahrangat Mountains, Nevada		May 26	Merriam	
18282	Female	Oasis Valley, Nevada		June 1	do	
18283	Male	Darwin, California		May 29	Palmer	
18284	Male	Panamint Valley, California		Apr. 24	Merriam	
18285	Male	Panamint Mountains, Wild Rose Spring, California	5,300	Apr. 16	Bailey	
18286	Male ¹	do	5,300	do	do	
18287	Male	Panamint Mountains, Cottonwood Canyon, California	4,900	May 26	Nelson	
18288	Female ¹	do	6,200	do	do	
18289	Female	do		June 14	do	3,900 feet above Salt Wells.
18290	Male ¹	Garlick Spring, California		Mar. 14	Palmer	
18291	Male ¹	Death Valley (Saratoga Spring), California.		Mar. 8	do	
18292	Male	Argus Range, Shepherd Canyon, California.		Apr. '28	Fisher	

¹ Young.

Crotaphytus wislizenii Baird and Girard—Continued.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	Date.	Collector.	Remarks.
			<i>Feet.</i>			
18293	Female.	Owens Valley, Independence, California	.....	June 14	Palmer	
18294	Male...	Mohave Desert, Southern Pacific Railroad, California, 2 miles below Cameron.	.....	June 26	Merriam...	
18295	Male...	Mohave Desert, 15 miles east of Mohave, California.	.....	Sept. 11	Stephens ..	
18296	Male...	Mohave Desert, north base of Granite Mountain, California.	.....	Apr. 5	Merriam...	
18297	Male...	Havilah, California .....	.....	June 24	...do	
18298	Male...	Kernville, California .....	.....	June 23	Palmer	
18299	Female.	Colorado Desert, Palm Spring, California.	.....	Sept. 27	Stephens ..	
18300	Female.	Coso, California .....	.....	May 28	Fisher.....	
18301	Male ¹	...do .....	.....	May 19	Palmer	
18302	Male...	Panamint Mountains (Emigrant Spring), California.	4,400	Apr. 14	Bailey	
18303	Female.	Saline Valley, California	4,000	June 30	Nelson	
18304	Female ¹	...do	2,300	May 22	...do	
18305	Female.	Owens Valley, 20 miles west of Bishop, California.	4,500	July 3	Stephens ..	
18306	Male...	Lone Pine, California .....	.....	June 8	Fisher	
18307	Female.	...do .....	.....	June 5	...do	
18308	Male...	...do .....	.....	...do	Palmer	
18309	Female.	...do .....	.....	June 6	...do	

¹ Young.

As to the food of this species Dr. Stejneger remarks:

The ferocity and greed of this species is well illustrated by several of the specimens caught. Thus the stomach of a young male (No. 18291) was found to contain two full-grown lizards, *Uta stansburiana*, while an adult female (No. 18276) when opened gave up one full-grown horned toad, *Phrynosoma platyrhinos*, besides remnants of a grown specimen of her own species.

The habits of *Crotaphytus wislizenii* are given by Dr. Merriam¹ as follows:

The leopard lizard is abundant in most, if not all, of the Lower Sonoran deserts of the Great Basin, from southern California eastward across southern Nevada to Arizona and southwestern Utah. While properly belonging to the lower Sonoran zone, it ranges up a certain distance into the Upper Sonoran, occurring farther north and higher on the mountain sides than either *Callisaurus* or *Dipsosaurus*, and usually a little higher even than *Cnemidophorus*.

It was found in abundance in all of the Lower Sonoran deserts traversed, from the Mohave Desert, Panamint and Death valleys, Ash Meadows, the Amargosa Desert, Indian Spring, Pahrump, and Vegas valleys to the Great Bend of the Colorado, and thence northerly through the valleys of the Virgin and Muddy, across the north-west corner of Arizona to the Santa Clara Valley in Utah, and Pahranaagat and Meadow Creek valleys in Nevada. The upper limit of its range was not reached except in a few places, as indicated by the following localities. It was abundant through Antelope Valley, at the extreme west end of the Mohave Desert, ranging thence northerly through the wash or open canyon leading to Tehachapi Valley. (It was not seen in Tehachapi Valley, which is not strange, as a sharp, cold wind blew the only day we were there.) It ranges completely over Walker Pass (altitude of divide 1,550 meters, or 5,100 feet) and is common in Owens Valley, ranging as far north at least as Bishop Creek, and as high as 1,980 meters (6,500 feet) along the west slope of the White and Inyo mountains (opposite Big Pine). On the east side of the White Mountains it is common in Deep Spring and Fish Lake valleys, and was found on the

¹ North American Fauna, No. 7, 1893, p. 167.

northwest slope of Mount Magruder (below Pigeon Spring) as high as 1,980 meters (6,500 feet). It was seen at the same elevation in Tule Canyon, but does not reach the Mount Magruder plateau (altitude about 2,450 meters, or 8,000 feet). Coming up through Grapevine Canyon from the northwest arm of Death Valley it spreads over Sarcobatus Flat, and ascends the south slope of Gold Mountain a little higher than the creosote bush (*Larrea*), which stops at about 1,640 meters (or 5,400 feet) on the most favorable southwest exposures. It is common in Oasis Valley (coming in from both Sarcobatus Flat and the Amargosa Desert), and doubtless ranges over most of the Ralston Desert. It was found on the Desert, Timpahute, and Pahrnagat mountains, as well as the intervening deserts, and on Pahroc Plain, and thence easterly across Meadow Creek Valley and the Juniper Mountain plateau (along the boundary between Nevada and Utah) to the Escalante Desert in Utah, and thence southerly through the sage brush to Mountain Meadows and the Santa Clara Valley. It was common on the Argus and Panamint mountains, and on the latter was taken as high as 1,610 meters (5,300 feet) near wild Rose Spring, and may range higher.

Crotaphytus wislizenii, in company with two other Great Basin lizards (*Cnemidophorus tigris* and *Uta stansburiana*), two desert birds (*Harporhynchus lecontei* and *Campylorhynchus brunneicapillus*), the antelope or white-tailed squirrel (*Spermophilus leucurus*), and a number of desert plants (among which may be mentioned the tree yucca, *Yucca arborescens*, *Tetradymia spinosa*, *T. comosa*, *Lycium andersoni*, *L. cooperi*, *Hymenoclea salsola*, *Eriogonum fasciculatum*, and *Ephedra nevadensis*) passes over the low summit of Walker Pass (altitude 1,550 meters, or 5,100 feet), and descends westerly to Kern Valley on the west slope of the Sierra. From Kern Valley *Crotaphytus wislizenii* ranges southward to Havilah, if not to Walker Basin.

The leopard lizard is chiefly a vegetarian, feeding on the blossoms and leaves of plants; but is also carnivorous, devouring the smaller lizards, horned toads, and even its own kind, besides large numbers of insects, as determined by the examination of many stomachs. In the Argus Range Dr. Fisher surprised one in the act of swallowing a scaly lizard (*Sceloporus*) two-thirds its own size.

In many lizards, as well known, the male assumes a special coloration during the breeding season. The present species is a notable exception, the male remaining the same, while the female undergoes a remarkable change. The whole under surface and sides of the tail become deep salmon or even salmon red, and the sides of the body assume the same color, either uniformly or in blotches. The red markings on the sides usually begin as spots, which soon unite to form transverse stripes. The central part of the back is not affected by the change, and the dark markings on the sides remain distinct. None were seen in this condition until May 20, when the first red one was found on Pahroc Plain, Nevada, but dozens were seen afterwards in Pahrnagat Valley, Indian Spring Valley, the Amargosa Desert, Tule Canyon, and numerous other localities. The change does not take place till late in the development of the egg. Many pairs were observed in copulation in Diamond and the Upper Santa Clara valleys, Utah, and thence northward to Mountain Meadows and the Escalante Desert, and westerly across the Juniper Mountains to Meadow Creek Valley from May 17 to 19, but no trace of the red coloration had appeared. The red individuals were always found to contain large eggs, generally measuring from 12 to 15 mm. in length, with the coriaceous shell already formed.

SAUROMALUS Duméril.

Sauromalus DUMÉRIL, Arch. du Mus., VIII, 1856, p. 535.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 149.—COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 177.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 202.

Euphyryne BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 253.

A gular fold and one along side of body. Sides of neck much wrinkled. Femoral pores. Scales everywhere small but lozenge-shaped

and imbricated and nearly equal. Tail conical, shorter than the body, with very short whorls. Claws very thick and strong, anterior much larger. Bars not concealed. Nostrils superolateral, in line with canthus rostralis. Tongue fleshy, with ten inferior terminal oval sessile pads. Palatine teeth distinct. Palate scarcely scooped out between posterior nares, which are farther back than in *Crotaphytus*. Posterior teeth (especially lower) with five lobes; anterior almost to very end of jaw, with three.

This genus is allied to *Uta*, and an approach to it is made by the *Uta thalassina* Cope.

The following description of the osteology of this genus is based on a skeleton of the *S. ater*, belonging to the U. S. National Museum.

The premaxillary has a long spine above and a transverse posterior border below with the anteriorly directed button process. The nasals are well developed and distinct in spite of the large size of the nares. Frontal entire, rather narrow, grooved on the middle line below, and including pineal foramen, which touches the coronal suture. Parietals divided, perhaps abnormally in specimen. Supraoccipital loosely attached, but fused with exoccipitals. Prefrontals large, not extending over orbits; lacrymals small, in contact with jugal. Postfrontal distinct, small. Apex of postorbital cartilaginous, inferior face in long contact with jugal and supratemporal. Paroccipital not large; parietoquadrate arch well separated from exoccipital. Postoptic not reaching frontal, superior extremity expanded backward and forward. Petrosal very short above, prolonged below, inferior groove looking laterally. *Fenestra ovalis* and *foramen nervi octavi* sunk in deep fossæ. Vomers entirely separated from maxillaries, not produced, but separated by a groove behind. Palatines with a short maxillary process. Palatine foramen moderate; pterygoids divaricating from each other outward. Ectopterygoid produced downward at the posterointernal angle. Pterygoids grooved from basipterygoids backward on internal side. Quadrate with two conchs, the internal one flat. The epistapedial cartilage is largely ossified.

Presphenoid a slender rod; sphenoid and basioccipital confluent. Occipital condyle with exoccipital elements slightly marked above.

In the mandible Meckel's cartilage is completely inclosed. The splenial is produced but little beyond the splenial foramen. Coronoid extended a little anteriorly at base on external face of ramus, and a little farther on the inner side. Dentary extending as far back as coronoid. Articular and surangular distinct.

The premaxillary and anterior maxillary teeth are simple; the other maxillaries have two or three denticles anteriorly and one posteriorly. In the dentary bone the teeth (except in front) have two denticles on each edge.

The hyoid apparatus displays a pair of parallel but separate second ceratobranchials about half as long as the first ceratobranchials. Cera-

tohyals slightly expanded proximally, articulated at end of moderately long hypohyals.

The vertebræ display a zygosphenal articulation. Five cervicals display free intercentra, and four of them have no ribs. Ribs extending to sacrum. The two sacral centra and diapophyses are distinct, but the second diapophysis has a median longitudinal groove. Caudal centra of the distal half of the tail segmented, and possessed for the middle of the length of double diapophyses, between which the fissure passes. Diapophyses long on basal third of tail. Neural spines low everywhere; on the caudal vertebræ they stand at the posterior end, and send a keel to the anterior end, where it is elevated into a low anterior spine. Chevron bones intercentral. Four sternal ribs and two from the xiphoid rod.

Scapula very short, with a large superior proscapula. Coracoid with two notches. Sternum wide and emarginate posteriorly, spreading the xiphoid rods far apart. No fontanelle.

Pelvis with the pubis transverse and the pectineal process external. Ischia rather slender, with a short symphysis, and each with a long tuberosity.

This genus is remarkable for the combination of characters it displays. The zygosphenal articulation allies it to *Dipsosaurus* and the larger Iguanidæ, but the separated ceratobranchials, and the wide sternum are like that of the Phrynosomas, with the exception of the fontanelles. The transverse pubes have a similar significance.

Of the habits of the species of *Sauromalus*, Dr. Stejneger remarks:¹

It has long been suspected that these lizards live on vegetable food, in fact, Dr. Streets' statement (*loc. cit.*) as to the nature of their excretæ made it almost certain; but, to remove all doubt, I had the stomach of one of the large specimens (collected by Mr. Townsend) opened, and Prof. W. B. Barrows, of the U. S. Department of Agriculture, had the kindness to submit the contents to one of the experts in that line for examination. He reports that the contents are exclusively vegetable and that the numerous seeds are those of a malvaceous plant, probably *Spharalcea hastulata*.

Two species of this genus are known, which differ as follows:

- Nuchal scales spiny, the largest almost as large as largest preauricular spines; dorsal scales ending posteriorly in a long obtuse spine; dorsal scale rows average 16 to a head length; number of ventral scale rows from gular fold to anus averages 118; number of scales round thickest part of tail averages 50; femoral pores, 12-15; larger average length, 540 mm. (Stejneger)..... *S. hispidus*.
- Nuchal scales tubercular or smooth, none of them half as large as largest preauricular spines; dorsal scales squarish, smooth, without spine; dorsal scale rows average 32 to a head length; number of ventral scale rows from gular fold to anus averages 165; number of scales round thickest part of tail averages 76; femoral pores, 15-18; size medium, length 314 mm. (Stejneger)..... *S. ater*.

¹ Proceedings, U. S. National Museum, XIV, 1891, p. 411.

SAUROMALUS HISPIDUS Stejneger.

Sauromalus hispidus STEJNEGER, Proc. U. S. Nat. Mus., XIV, 1891, p. 409.

Sauromalus ater STREETS, Bull. U. S. Nat. Mus., No. 7, p. 36.—TOWNSEND, Proc. U. S. Nat. Mus., XIII, 1890, p. 144.

Habit very stout, head depressed, body less so; nostrils large, tubular, opening upward and outward; upper head scales large, considerably larger than the supraoculars, those of the parietal region largest,

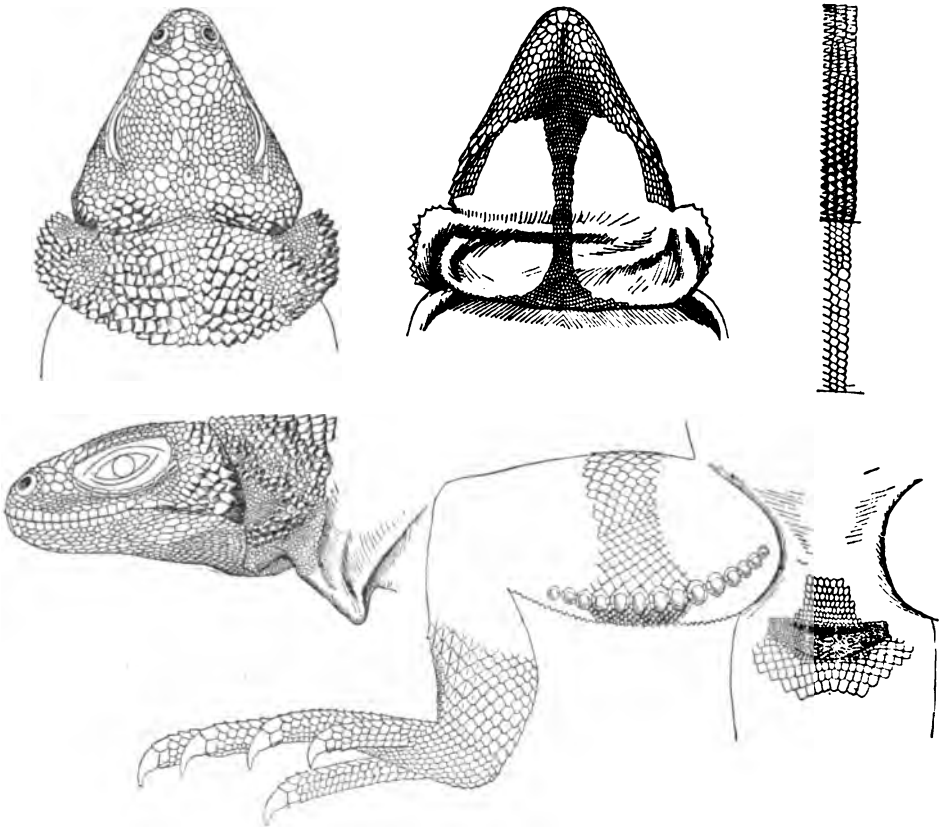


Fig. 22.

SAUROMALUS HISPIDUS STEJNEGER.

× $\frac{1}{2}$.

Angel Island, Gulf of California.

Cat. No. 8563, U.S.N.M.

tubercular, some nearly conical; three series of strong conical scales in front of ear; several series of large conical tubercles on side of basal half of mandible; neck above very rough, covered with large but obtuse spines, most of them fully as large as the anteaauricular denticulation, and descending on the postauricular fold, sending a strong branch forward, nearly connecting with the mandibular spines; dorsal

scales large, 16 in a head length, ending posteriorly in an obtuse spine, even the smaller scales above and back of the arms being spiny; ventral scales smaller and smoother, but the outer posterior corner somewhat projecting and pointed, about 118 scales in a line from anal opening to gular fold; scales on limbs large, about the size of those on nape, carinated and obtusely spinose; femoral pores very large, 13 on each side; scales on tail in verticils, large, about 44 in a verticil round the thickest portion at base, on the upper surface carinate and strongly spinose behind. Color (in alcohol) apparently uniform brownish olive, though in life they are said to be "marked with one, two, or three large, rounded, or irregular grayish blotches somewhere on their body."¹

In addition to the type specimen I have before me three others nearly as large, collected by Mr. Charles H. Townsend in the same locality. They agree in all essential characters with the type, some of the details and measurements (in millimeters) being found in the following table:

Sauromalus hispidus.

U. S. N. M. No.	Collector and number.	Locality.	Date.	Dorsal scale rows in head length.	Ventral scale rows, anus to gular fold.	Scales round thick- est part of tail.	Femoral pores.	Total length.	Length of tail.
8563	Streets	Angel Island, Gulf of California.	.....	16	118	44	13	mm. 585	mm. 285
15873	Townsend, 24	do	Mar. 29, 1889.	19	116	55	13	552	275
15874	do	do	do	15	113	43	13	562	292
15875	do	do	do	14	126	53	13	462	240
Average of four specimens.....				16	118	49	.....	.....	.....

This enormous lizard is closely allied to the much smaller species which inhabits the arid regions on the mainland to the north of the Gulf of California, namely, *Sauromalus ater*, with which it has been confounded, but is readily distinguished by the characters given in the above diagnosis. In order to better emphasize the differences I herewith give the corresponding diagnosis of the old species.

In all probability the young of *Sauromalus hispidus* is much less spiny than the old ones, but the scales would be much larger than in corresponding specimens of *S. ater* and their number consequently smaller. (Stejneger.)

¹Streets, Bulletin U. S. National Museum, No. 7, p. 36.

SAUROMALUS ATER Duméril.

Sauromalus ater DUMÉRIL, Arch. du Mus., VIII, 1856, p. 536, pl. xxiii, fig. 3.—COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 177.—BOCOURT, Miss. Sci. Mexique Reptiles, 1874, p. 149, pl. xvii bis, fig. 11.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 202.

Euphryne obesa BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 253; U. S. Mex. Bound. Sur., 1859, Reptiles, p. 6, pl. xxvii.

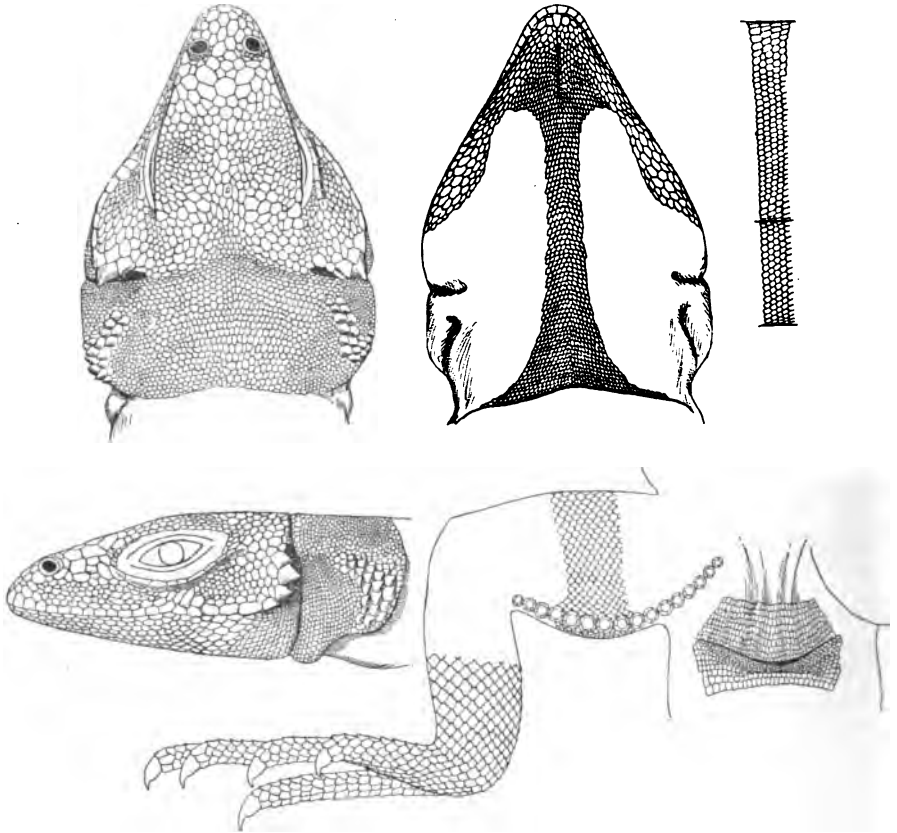


Fig. 23.

SAUROMALUS ATER DUMÉRIL.

× 2.

Yampai Valley, Arizona.

Cat. No. 12264, U.S.N.M.

Body very stout and form heavy; belly large; limbs (including claws) stout, short, and thick; tail scarcely larger than body, very much thickened and depressed at base.

Top and sides of the head covered with nearly equal subhexagonal tubercular scales, only a little smaller on the supraorbital region and cheeks. Orbits bounded inferiorly by a chain of about ten nearly equal scales. Ear conspicuous, its anterior edge dentate. About twenty

rows of scales along a broad median space of the back much larger than more laterally; those on the nape as large as those on the top of the head; they are imbricated and angularly tuberculated, but not carinate. The scales on the sides of body and beneath from chin to anus are excessively minute, almost like shagreen, and arranged in quincunx. The scales, limbs, and upper and lateral surfaces of the tail faintly carinate. Femoral pores filled with a greenish mass. No anal plates.

Width of head nearly equal to the distance from the nose to ear.

In the young the general color is olive green, absolutely marbled with dusky (or else dusky, spotted with olive green), with five broad transverse bars between the head and tail. These bars are composed of single red and yellow scales intermixed, and are scarcely distinguishable. The tail is black, with three or four broad rings of yellow, dotted with red; much more distinct than the dorsal bars. The under parts are pea green, dotted with black points, the chin and between the fore legs with red. With increasing age these bars disappear to a greater or less degree until the general color above is reddish olive obscurely reticulated with darker; the sides and beneath dotted with black, with an occasional light dot on the back.

This species differs from those of *Crotaphytus* in the very heavy, squat form (equal to that of many *Phrynosomas*), and short limbs and tail. The ventral scales and those along the middle of the back are much larger than those more lateral, and all those beneath are much smaller. The anterior margin of the ear is strongly dentate instead of only crenate. There are no larger post-anal plates.

From *Dipsosaurus dorsalis* it is known by the obese proportions, the absence of the single line of keeled scales on the back, and the absence of carination on the upper scales generally. The tail is depressed at the base, not compressed. The belly and gular scales are excessively minute instead of quite large.

Dr. Stejneger gives the following table of details and measurements:

Sauromalus ater.

U. S. N. M. No.	Collector.	Locality.	Date.	Dorsal scale rows in head length.	Ventral scale rows, anus to gular fold.	Scales round thickest part of tail.	Femoral pores.	Total length.	Length of tail.
12264	Möllhausen	Yampai Valley.....		29	162	78	about 100	mm.	mm.
4172	Thomas	Fort Yuma, Arizona.....		28	182	73		388	263
11810	Möllhausen	Colorado River.....		34	161	72		302	140
16503	Oreutt	San Diego County, Cal.	Apr. —, 1889	31	160	77		313	153
11810 ¹	Möllhausen	Colorado River.....		37	² 160	² 80		253	125
								180	85
Average of five specimens.....				32	165	76			

¹ Young.

² About.

Sauromalus ater Duméril.

Catalogue No.	Number of specimens.	Locality.	Date.	From whom received.	Nature of specimen.
4772	1	Fort Yuma, California.	.....	Maj. G. H. Thomas, U. S. A.	Alcoholic.
8563	1	Angel Island, Gulf of California.	.....	Dr. T. H. Streets, U. S. N.	do.
12264	1	Yampai Valley, California.	.....	H. B. Möllhansen.....	do.
12633	1	La Paz, Lower California	Feb. —, 1882	L. Belding.....	do.
11810	2	Colorado River.....	.....	Lieut. J. C. Ives, U. S. A.	do.
16337	1	Coyote Wells, Colorado Desert, California.	.....	C. R. Orcutt.....	do.
16503	1	Colorado Desert, California.	.....	.....do.....	do.
22286	1	Southwestern United States.	.....	National Zoological Park.	do.

U. S. N. M. No.	Sex and age.	Locality	Altitude.	Date.	Collector.
18621	Male.	Santa Clara Canyon, Utah.....	.....	May 11	Bailey.
18622	Male.	St. George, Utah.....	3,000	May 13	Merriam.
18623	Female.	do.....	.....	May 14	do.
18624	Adult.	Pahrump Valley, Nevada.....	.....	Apr. 28	do.
18625	Adult.	Amargosa Valley, California.....	.....	Apr. 27	do.
18626	Adult.	Lookout, Inyo County, California.....	.....	Mar. 27	Bailey.
18627	Young.	Death Valley, Furnace Creek, California.....	.....	Mar. 22	Fisher.
18629	Male.	Panamint Mountains, Widow Creek, California.....	4,500	May 19	Nelson.
18630	Adult.	do.....	.....	Apr. 21	Coville.
18631	Male.	Argus Range, Shepherd Canyon, California.....	.....	Apr. 29	Fisher.
18632	Male.	do.....	.....	do.....	do.
18633	Male.	do.....	.....	do.....	do.
18634	Male.	do.....	.....	Apr. 28	do.
18635	Female.	do.....	.....	Apr. 23	do.
18636*	Adult.	do.....	.....	.....	do.
18637	Adult.	do.....	.....	Apr. —	do.
18638	Adult.	do.....	.....	Apr. —	do.
18639	Adult.	do.....	.....	Apr. —	do.

* Adult.

* Skin.

Dr. Stejneger remarks as to the distribution of this species:

Beyond rather vague statements as to the general distribution of the present species very little exact information in regard to its range has been published. It is evident that the localities from which the expedition brought home its specimens—almost four times as many as in any museum before—form the center of the geographical range of the “chuck-walla.” From here it extends southward along the Colorado River for an unknown distance, ranging westward into the Colorado Desert, and eastward along the Gila into Arizona. Dr. Merriam has now, for the first time, definitely demonstrated its occurrence in southern Nevada and southwestern Utah.

The habits of *Sauromalus ater* are described as follows by Dr. Merriam in his report on the results of the Death Valley expedition:

The “chuck-walla,” by which name this remarkable lizard is universally known to both Indians and whites (except the Mormons), inhabits many of the Lower Sonoran Desert ranges in the southern part of the Great Basin from the Mohave and Colorado deserts easterly across southern Nevada to Arizona, and north to the southwestern corner of Utah. It is the largest lizard of the desert region except the Gila Monster (*Heloderma*), which only slightly exceeds it in size. The broad body is black or blackish, and the large blunt tail is usually marbled with white or entirely white. It was generally found on lava or other dark rocks with which its coloration harmonizes. It is a vegetarian, feeding entirely, so far as our observations go, on

the buds and flowers of plants, with the addition sometimes of a few leaves. It is much prized by the Panamint Indians as an article of food. A number were eaten by members of our expedition, and the flesh was reported to be tender and palatable.

Specimens were secured by the Death Valley expedition in the Panamint Range, the Amargosa Canyon, on a lava knoll on the west side of Pahrump Valley, California, and in the Lower Santa Clara Valley in Utah. In the latter locality they are common both along the canyon of the Lower Santa Clara and among the red sandstone cliffs near the village of St. George, and are called "alligators" by the Mormons. Dr. Fisher found them in considerable numbers in the Argus Range, west of Panamint Valley, and examined a number of stomachs, in which he found the following plants (either flowers or foliage, or both): *Dalea fremontii*, *Leptosyne bigelovii*, *Amsinckia tessellata*, *Lotus*, *Sphaeralcea munroana*, and *Ephedra viridis*.

CALLISAURUS Blainville.

Callisaurus BLAINVILLE, Nouvelles Ann. du Museum, IV, 1835, p. 286.—DUMÉRIL and BIBRON, Erp. Gén., IV, 1837, p. 324.—GRAY, Cat. Liz. Brit. Mus., 1845, p. 226.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 158.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 205.

Homalosaurus HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1852, p. 179.

A gular and lateral fold; the sides of neck and throat wrinkled; scales nearly even; superciliary scales tectiform. Femoral pores present, pierced in undivided scales; upper labial oblique; occipital large; plates between orbital spaces; nostrils superior within the ends of the canthus; no palatine teeth; cheek teeth conical; posterior only faintly tricuspid; tongue very little free at end.

This genus is represented by one rather variable species. Its habitat is the Lower Californian and Sonoran districts.

CALLISAURUS DRACONOIDES Blainville.

Callisaurus draconoides BLAINVILLE, Nouv. Ann. du Mus., IV, 1835, p. 286, pl. XXIV.—GRAY, Cat. Liz. Brit. Mus., 1845, p. 227.—DUMÉRIL and BIBRON, Erp. Gén., 4, 1837, p. 326.—BOCOURT, Mission Sci. Mexique, 1874, p. 158, pl. XVII bis, fig. 10.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 206.—COPE, Bull. U. S. Nat. Mus., 1875, No. 1, p. 47.—VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, p. 95.

Homalosaurus ventralis HALLOWELL, Proc. Phila. Acad. Nat. Sci., VI, October, 1852, p. 179; Sitgreaves, Report, 1853, p. 117, pl. IV.

Callisaurus ventralis BAIRD, U. S. Mex. Bound. Surv., Reptiles, 1859, p. 8.—STEJNEGER, N. Amer. Fauna, No. 7, Pt. 2, p. 171.—VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, p. 97.

Hind feet half as long as head and body; free portion of longest hind toe nearly twice the cephalic plates; femoral pores 14 or 15.

Above and on sides light greenish gray or ash, thickly marked with rounded lighter spots, beneath yellowish white. On rump ten series of blotches, which continued on tail become rings, which are intensely black below; sides of belly blue, with ten oblique elongated indigo-black blotches, the posterior largest and two-branched, the posterior directed

backward. Female without blue on belly, the black of sides very faintly indicated; the sides with a series of indistinct close blotches extending on sides of tail.

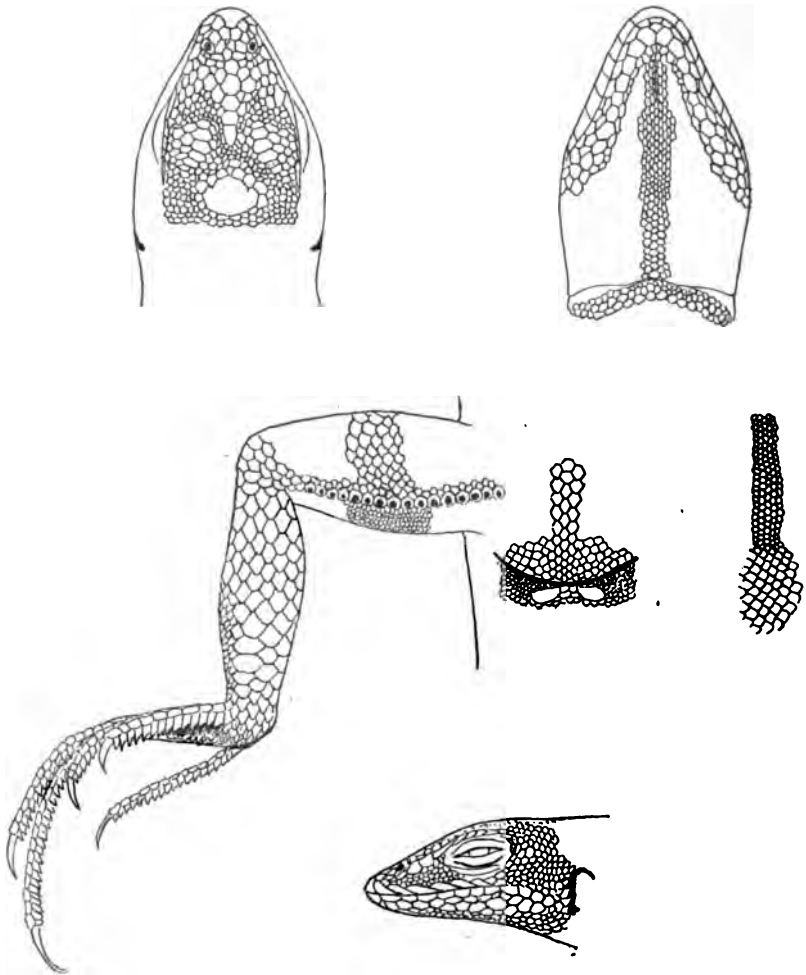


Fig. 24.

CALLISAURUS DRACONOIDES DRACONOIDES BLAINVILLE.

Cape San Lucas, Lower California.

Cat. No. 5300, U.S.N.M.

Another variety is darker above, varied with red, and with few or no light spots on the back, which has, besides, two distinct series of dorsal blotches from head to tail.

The head is much depressed, nearly as broad as long; the muzzle wide and rounded. The width is equal to distance from snout to end of large occipital plate. The labials and rostrals form a projecting horizontal shelf; the series distinctly visible from above. They are

imbricated oblique, as in the allied genera *Holbrookia*. There are seven large oblique upper labials. The plates margining the lower labials behind are decidedly larger than those on the cheeks. There are about 180 oblique series of scales from head to above anus, arranged in rather irregular oblique series. The tail is rather longer than the body, much depressed and flattened to the extreme tip, and tapering regularly from near the base. The hind feet are nearly or quite half the head and body, the free portion of longest toe nearly twice the length of cephalic plates. There are 14 or 15 femoral pores.

The colors and markings of this species are quite similar to those of *Holbrookia texana*. The ground color in the type specimen is a pale yellowish gray, with ten series of dull blotches on the lower part of the back, becoming confluent on the tail and encircling this as a series of five or six rings, which are intensely black beneath. The five more anterior ones are blotches beneath, not spots. The most of the back and sides is uniformly and rather finely marked with approximated rounded lighter spots. The legs are banded transversely with dusky. The under parts are yellowish white; the whole posterior face of the thigh similar, with a distinct stripe of dark plumbeous, bounded above by a yellowish line, part of the ground color. In *Holbrookia* this line is bordered immediately above by the ashy gray of the upper ground color.

In the male there is a blue patch on each side of the belly (separated by twelve or fourteen scales) and not extending on the colored part of the sides. In this are situated two indigo-black patches on each side; subtriangular, broadest and truncate at the base inferiorly, and running obliquely forward and upward. The hinder one (the largest) has the posterior and inferior angle extended backward, so as to constitute a kind of crescent, with the antero-inferior face an obtuse isosceles angle, the postero-superior a regular concavity. These two marks on each side occupy about the middle of the space between the fore and hind legs. The anterior runs rather farther up on the sides than the posterior.

Cat. No. 4121 differs in having the ground color darker; the back with ten series of distinct dorsal blotches, about ten from head to above anus. The light spots are scarcely appreciable above, more so on the sides, where they show traces of having been reddish. The posterior angle of the hinder black blotch is much extended, reaching nearly to the groin and much longer than the anterior angle. The head beneath is light plumbeous and, with the jaws, varied with bluish.

In life it is probable that there is a good deal of red on the sides and back.

The female lacks the blue on the side of belly, and but faint indication, if any, of the black marks. There is a tendency to a series of dusky subquadratic blotches on the sides, more than in the male, and extending along the side of the tail. There are in some specimens oblique

bars on each side of the chin and one or two on the side of the neck next to the shoulder.

The description of *Callisaurus draconoides* by Blainville is too incomplete to permit us to determine if it is identical with *C. ventralis* of Hallowell. The back is indicated as transversely banded, and the sides of the belly as with three spots, which scarcely applies to the *ventralis*. The numerous specimens in the U. S. National Museum from Cape St. Lucas and La Paz enable us to determine it as the same.

In external form and general appearance this species is so very similar to *Holbrookia texana* as not to require any very elaborate description. The most prominent points of distinction are seen in the excessively lengthened feet and distinct external auditory aperture. This is narrow, elliptical, and vertical; the borders smooth, or with a faint crenation anteriorly. The dentate processes of the lower eyelid are longer than in *Holbrookia*; the plates on the chin smaller, as also the imbricated scales on the anterior edge of the humerus. The scales on the sides are rather more rounded and paved, as well as a little smaller than those of the back. The feet are excessively lengthened; the hind foot very nearly or quite half the head and body; the toes very slender. The claws are all much longer, straighter, and more compressed than in *Holbrookia texana*.

Three varieties or subspecies of the *Callisaurus draconoides* may be recognized, but they are not sufficiently constant to be entitled to permanent rank. They are represented, respectively, by specimens from the southern part of the peninsula of Lower California, from the northern part of the same, and from the southern part of Arizona. They are characterized as follows:

- I. A band of granular scales before as well as behind scales of collar. Superciliary scales smaller, separated on the middle line; smaller scales before ear; collar scales pointed behind; three black lateral spots; legs shorter; wrist and hind foot not reaching end of muzzle *C. d. draconoides*.
- II. A band of granular scales behind collar only. Superciliary scales equal frontals and in contact on middle line; larger scales before ear; legs longer; wrist beyond muzzle, hind foot mostly so *C. d. gabbi* (Cope).
- III. No granular bands on throat. Small scales before ear; collar scales not pointed behind; two black spots on sides, the posterior prolonged backward; feet long; wrist to beyond muzzle, hind foot equal or beyond muzzle.. *C. d. ventralis*.

Callisaurus draconoides draconoides Blainville.

Catalogue No.	Number of specimens.	Locality.	Date.	From whom received.	Nature of specimen.
12647	32	La Paz, L. California....	— —, 1882	L. Belding.....	Alcoholic.

Callisaurus draconoides ventralis Hallowell.

Catalogue No.	Number of specimens.	Locality.	Date.	From whom received.	Nature of specimen.
2670	1	West of Rio Grande, Tex.		Dr. S. W. Woodhouse.	Alcoholic type.
8155	1	Arizona			Alcoholic.
8481	1	Apache, Arizona.		H. W. Henshaw.	do.
8638	1	Mohave Desert, Cal.		Dr. O. Loew.	do.
2661	5	Colorado River		Lieut. J. C. Ives, U. S. A.	do.
11419	3	do		do	do.
10615	1	(?)			do.
10614	1	Arizona		Dr. R. T. Burr.	do.
10613	1	do		do	do.
10618	1	do		do	do.
10612	1	do		Dr. R. T. Burr.	do.
10619	1	do		do	do.
10617	1	do		do	do.
10611	1	do		Dr. R. T. Burr.	do.
10616	1	do		do	do.
15876		Puerto Refugio, Angel Island, Gulf of California.		U. S. Fish Commission	do.
15878-79		San Juan Lagoon, Rio Ahome, near Guaymas, Mexico.		do	do.
15882-87		San Luis, Gonzales Bay, Gulf of Mexico.		do	do.
15049		Fort Yuma, Arizona.		do	do.
15956		Yuma, Arizona.		do	do.
16510		Colorado Desert, San Diego County, Cal.		C. R. Orcutt.	do.
16519		do		do	do.
17646		Tempe, Arizona		Edgar L. Stormont.	do.
19708-22		Fort Huachuca, Arizona		Wilcox	do.
15589		"S. Lake to Cal." (?)		J. S. Bowman (?)	do.
15734		Vulture, Arizona.		L. Stejneger	do.
16809		Guaymas, Mexico.	Feb. 27, 1891	P. L. Jouy	do.
16810-12		Tucson, Arizona.	Mar. —, 1891	do	do.
16338-46		do		do	do.
19098-102		Colorado Desert, Palm Spring, California.		F. Stephens.	do.
21504		El Rosario, California.		A. W. Anthony.	do.
21505-10		San Fernando, 20 miles from Pacific Ocean, Lower California.		do	do.
21858-73		Yuma Desert, Mon. 200 Arizona.		Dr. E. A. Mearns.	do.
21941		Seven Wells, Salton River, Colorado Desert, Lower California.		do	do.
21942		Gardner's Laguna, Colorado Desert, Lower California.		do	do.
21943-44		Coyote Wells, San Diego County, California.		do	do.
21945-49		Mount Spring, east slope Coast Range, California.		do	do.
22581		West of Oak Grove, San Diego County, California.		C. R. Orcutt.	do.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	Date.	Collection.	Remarks.
			Feet.			
18207	Male	Death Valley (Bennett Wells), Cal.		Apr. 4	Bailey	
18208	Female ..	do		Apr. 1	do	
18209	Female ..	do		Apr. 4	do	
18210	Female ..	do		Jan. 22	do	
18211	Male	do		Apr. —	do	
18212	Male	do		Mar. 22	Nelson	
18213	Male	do		Jan. 20	do	
18214	Female ..	Death Valley, Furnace Creek, Cal.		June 20	Fisher	
18215	Female ..	Argus Range, Shepherd Cañon, Cal.		Apr. 27	do	
18216	Male	Panamint Valley, California		Apr. 24	Merriam	
18217	Male	do		do	do	
18218	Male	do		do	Fisher	
18219	Male	do		do	Bailey	
18220	Female ..	do		do	do	

Callisaurus draconoides ventralis Hallowell—Continued.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	Date.	Collection.	Remarks.
			<i>Feet.</i>			
18221	Male ¹	Panamint Valley, California.....		Apr. 24	Bailey	
18222	Male	Death Valley (Saratoga Springs), Cal.		Mar. 8	Palmer	
18223	Male	do		do	do	
18224	Male ¹	do		Feb. 2	Bailey	
18225	Male ¹	do		do	do	
18226	Female	Owens Lake, Olancho, California.....	8,700	May 19 ¹	Stephens	
18227	Male	Water Station, Borax Flat, California.	2,200	Apr. 22	do	
18228	Male	Garlic Springs, California.....		Mar. 14	Palmer	
18229	Male	Panamint Mountains (Emigrant Spring), California.		Apr. 14	Bailey	
18230	Male ¹	do		do	do	
18231	Male ¹	Funeral Mountains, California.....		Feb. 6	Nelson	
18232	Female ¹	do		do	do	
18233	Female	Owens Valley (Lone Pine), California.		June 6	Palmer	
18234	Male	Cameron, 8 miles northwest Mohave, California.		June 26	do	
18235	Male	Saline Valley, California.....	2,500	Jan. 20	Nelson	
18236	Male	Sarcobatus Flat, Nevada.....	4,400	June 2	Merriam	
18237	Male	do	4,600	do	Bailey	
18238	Male	Amargosa River, Nevada.....		Mar. 21	Fisher	
18239	Female	do		do	do	
18240	Male ¹	Amargosa River, California.....		Apr. 27	Bailey	
18241	Male	Ash Meadows, Nevada.....		Mar. 20	Fisher	
18242	Male ¹	do		Mar. 18	do	
18243	do	do		Mar. 4	Nelson	
18244	Female ¹	do		do	do	
18245	Male	Great Bend of Colorado (Callville), Nevada.		May 4	do	
18246	Male	do		do	do	
18247	Female	do		do	do	
18248	Female ²	do		do	do	
18249	Male	Pahranagat Valley, Nevada.....		May 23	Bailey	
18250	Male	do		do	do	
18251	Male	do		do	Merriam	
18252	Female ²	do		do	do	
18253	Male ¹	do		do	do	
18254	Male	Pahrump Valley, Nevada.....		Apr. 29	Bailey	
18255	Female	do		do	Merriam	
18256	Female	Desert Valley, Nevada.....	5,300	May 21	do	
18257	Female	Gold Mountain, Nevada.....	6,000	June 3	Bailey	
18361	Female	Mohave Desert, California, Leach Point Valley.		Apr. 25	do	
18362	Female ¹	do		do	do	

¹ Young.² Adult.

In his report on the Reptiles of the Death Valley Expedition Dr. Stejneger remarks, "It can be asserted with confidence that *Callisaurus draconoides ventralis* does not occur anywhere within the interior valley of California, not even in Walker basin. Nor is there any evidence to show that it occurs anywhere southwest of the San Bernardino range, within the boundary of the State of California."

Dr. Merriam¹ gives the following description of the habits of *Callisaurus draconoides ventralis*:

The gridiron-tailed lizard is the most characteristic reptile of the Lower Sonoran deserts of southern California, southern Nevada, southwestern Utah, and Arizona, where it is almost universally distributed and very much more abundant than any other species. It inhabits the open deserts and runs with great swiftness over the sand and gravel beds, carrying its tail curled up over its back as if afraid to let it touch the hot surface of the earth. It starts off at full speed, as if fired from a cannon, and stops with equal suddenness, thus escaping or eluding its enemies, the coyotes, hawks, and larger lizards. When running it moves so swiftly that the eye has difficulty in following, and when at rest its colors harmonize so well with

¹ North American Fauna, No. 7, 1893, p. 171.

those of the desert that it can hardly be seen. The basal half of its tail is transversely barred underneath, and the bars are broad and distinct, suggesting the name here applied to the species in lieu of a better one. During the breeding season the males develop a conspicuous patch of metallic greenish-blue on the sides of the body and have the power of inflating a pinkish sac under the chin.

The attitude of this lizard when at rest differs from that of most others, in that the knees and elbows stand out at right angles from the body, and are elevated to such a degree that they nearly reach the plane of the back. Like many other spe-

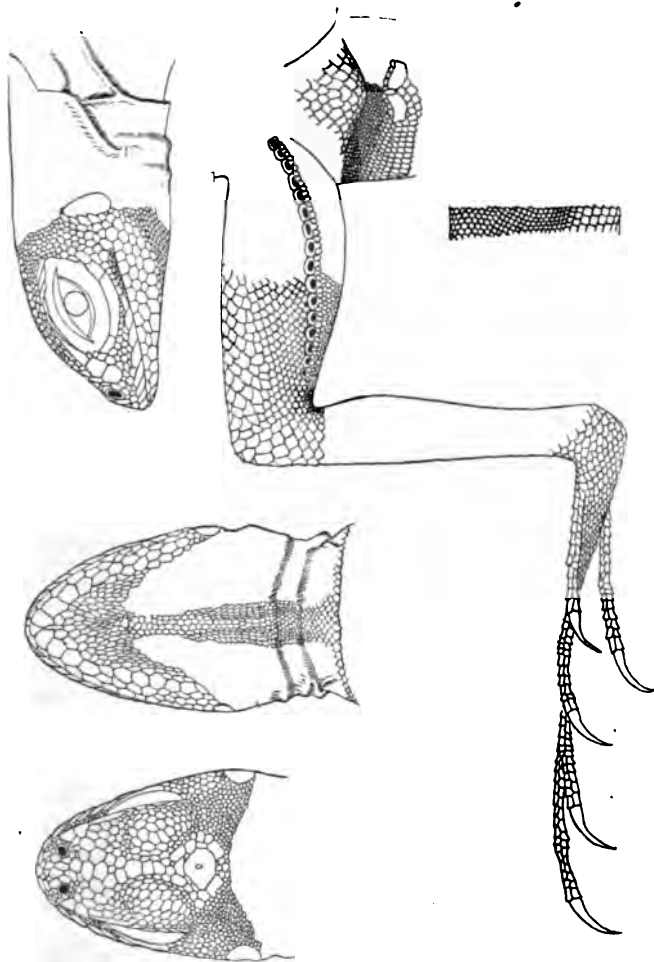


Fig. 25.
CALLISAURUS DRACONOIDES VENTRALIS HALLOWELL.
Mojave Desert, California.
Cat. No. 5839, U.S.N.M.

cies, it has an odd habit of performing a singular gymnastic exercise, consisting in rapidly dropping and elevating the body with the knees held stiff at right angles to the trunk.

This species feeds on insects and the blossoms and leaves of plants in about equal proportion; at least such was the case in the large number whose stomachs were examined.

The gridiron-tailed lizard is common throughout the Mohave Desert proper, but does not reach the extreme western end of the desert in Antelope Valley, which, owing to its greater altitude, passes out of the Lower Sonoran zone. It was last

seen in this direction about 10 miles east of Liebre ranch. In the wash leading from the Mohave Desert to Tehachapi Valley it was seen up to 1,030 meters (3,400 feet) and may range higher. It is common in the Lower Sonoran zone at the south end of Owens Valley, and ranges up on the warm east side of the valley as far as Big Pine. It is common throughout Panamint and Death valleys and in the Amargosa Desert. In Nevada it inhabits the deserts of the southern part of the State, from Ash Meadows easterly across Pahump and Vegas valleys to the Great Bend of the Colorado, where it is very common, and ranges north through the valleys of the Virgin and Lower Muddy (where it is abundant) to Pahrnagat and Meadow Creek valleys. In western Nevada it comes through Grapevine Canyon (from the northwest arm of Death Valley), ranges easterly over Sarcobatus Flat, and ascends the warm south slope of Gold Mountain, with *Larrea*, to about 1,640 meters (5,400 feet). In Utah it is common in the Lower Santa Clara Valley, but does not range up into the sagebrush or Upper Sonoran zone of the upper part of the valley.

In Desert Valley, just east of the Pahroc Mountains, a form of this species was found which seems to be subspecifically distinct from the ordinary type. It is much shorter and broader, with a shorter tail, and is bluish gray in color. It may be the same as the animal inhabiting the desert at Pyramid Lake, Nevada, which point is about 2° farther north than Desert Valley, though in the same zoological subzone, for the low altitude of a series of narrow and irregular deserts in western Nevada carries this zone much farther north than elsewhere. These specimens suggest the existence of a form peculiar to the upper division (or *Grayia* belt) of the Lower Sonoran zone, *Callisaurus ventralis* proper being closely restricted to the lower division (or *Larrea* belt) of the same zone.

UMA Baird.

Uma BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 253.—COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 310.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 206.

Angular fold. Femoral pores present, pierced in an undivided scale. Superciliary scale tectiform. Ears exposed: Occipitals small. Nostrils superior, within the canthus rostralis. Upper labials oblique, angular. Tongue scarcely notched at the end; attached almost to the very tip. Cheek teeth tricuspid. Claws long, acute, with an internal excavation which produces a sharp edge, the base inclosed in a sheath of two large scales. A fringe of free scales on each side of some of the digits and on the external side of the sole.

This interesting genus differs from *Callisaurus* in the lateral instead of vertical direction of its claws, and in the presence of fringes on the borders of its digits and soles. The latter character occurs elsewhere in the Geconian genus *Ptenopus* (Gray), which inhabits the deserts of South Africa, and in *Phrynocephalus*, a genus of Agamidæ which inhabits the deserts of Asia. As the genus *Uma* is also found in deserts it is probable that this structure has a direct relation to the mode of life of the animal. It is probably, like its allies, a swift runner, but rapid progress in the sand is very difficult. The long fringes of stiff scales aid the lizard materially in maintaining a foothold by their penetrating the sand. It is interesting to find this structure present in two genera of such widely diverse affinity and habitat. I append a figure of the foot of the *Ptenopus garrulus*, taken from a specimen for the opportunity of studying which I am indebted to Dr. Alexander

Agassiz, the distinguished director of the Museum of Comparative Zoology, of Cambridge, Massachusetts.

The species of *Uma* may be distinguished by the following characters, among others:

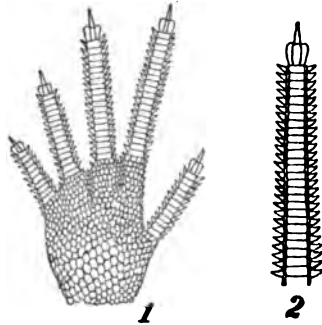


Fig. 26.

PTENOPUS GARRULUS SMITH.

1, posterior foot from below; 2, a digit from below, enlarged.

- I. Black crescents on the throat and a black spot on each side of the belly.
Labial scales strongly keeled; 6 keeled suborbital scales; 8 loreal rows; hind foot shorter, one-third head and body; femoral pores 40-50; dorsal spots black..... *U. scoparia* Cope.
- II. Black spot on side of belly, but no crescents on throat.
Labial scales strongly keeled; 3 or 4 keeled suborbitals; 5 or 6 loreal rows; 10 or 11 supraocular rows; hind foot shorter, one-third head and body; femoral pores 24-28; dorsal spots rufous..... *U. rufopunctata* Cope.
Labial scales weakly keeled; 9 loreal rows; 14 supraorbital rows; hind foot longer, two-fifths head and body; femoral pores 19..... *U. notata* Baird.
- III. No black spots on belly or crescents on throat.
Labial scales strongly keeled; 5 or 6 loreal rows; 10 or 11 supraocular rows; hind foot shorter, one-third head and body; femoral pores 19.
U. inornata Cope.

In the young the disciform areas are imperfectly outlined.

All the species are from the Sonoran region.

UMA NOTATA Baird.

Uma notata BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 257.—COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 360.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, p. 207, 1885.

Occipital plate small; nearly circular; surrounded by small plates; smaller posteriorly. The supraorbital region bordered internally on the median line of the head by a series of small frontal plates, those of opposite sides in contact along the vertex, which are separated from the larger occipital behind by two rows of plates. Plates on the snout nearly equal, those between nostrils and orbit as large on the sides as in the middle, eight or nine between the canthal rows; canthal row including one long posterior and one short anterior scale. Plates on supraorbital region very small, and showing about fourteen series trans-

versely, although three or four of those in the inner half are larger than elsewhere. The plates in the loreal region between the canthus rostralis and the labials in eight or nine rows; the labials, though imbricated, are little oblique, and have the outer edge flattened and vertical instead of carinated. The pectinated processes of the lower eyelid are very large and close. The lower labials are margined internally by several series of flattened plates much larger than those on the middle line of chin, and larger than those on the cheeks, which diminish above. The scales are excessively minute above, without appreciable difference in size. They are generally much as in *Holbrookia* and *Callisaurus*, except that on the anterior face of the humerus is one series of large, and three or four of rather smaller, scales conspicuously larger than those adjacent to them. The scales anterior to the femoral pores are abruptly smaller than those on the anterior edge of the thigh, and scarcely larger than those behind the pores. There are seventeen or eighteen femoral pores.

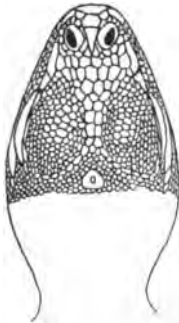


Fig. 27.

UMA NOTATA BAIRD.

Head from above.

Arizona.

× 3.

Type No. 4124, U.S.N.M.

The body of this species is depressed, the head very broad and depressed, the profile plane anteriorly, though sloping rapidly. The muzzle is more pointed than in the species of *Callisaurus*. The ear is narrow and vertical and concealed, except for a short space below, by a fringe of three or four large flattened triangular scales situated on the extreme anterior edge of the aperture, with four or five series of small tubercular scales between them and the larger plates of the cheeks. The scales on the central line of the breast are smaller than those nearer the shoulders.

The legs are long, the hind foot about two-fifths the head and body; the free portion of hind toe about as long as the cephalic plates. The forefingers are unequal; the claws very long. The tail is evidently depressed to the left; probably as long as body.

The color of this species is a light pea-green above, marked uniformly above by small spots of darker green, apparently arranged in ten series. Interspersed with these are a few whitish spots, which may perhaps be a lighter border behind of the green ones. The under parts are white, a single rounded black spot being visible on the extreme edge of the belly on either side, equidistant between fore and hind legs. The chin is marked sharply with a few oblique spots of light blue; the middle of the throat with more transverse ones of blue-black. The tail is broken off, and it is impossible to say whether there are any rings or black bands below.

In general form this lizard differs much more from *Callisaurus ventralis* than the latter does from *Holbrookia texana*. The former has a distinct ear opening, with the tympanic membrane very near the sur-

face, instead of being concealed, as in *Holbrookia texana*. The greater length of feet is specific rather than generic.

The difference from *Callisaurus ventralis* is seen first in the ear, which is deeper and concealed above by a fringe of large scales, wanting in the other. There are also several series of small tubercles to the large plates of the cheeks, instead of the aural aperture being immediately behind these. From both *Callisaurus ventralis* and *Holbrookia texana* it differs in the much smaller and more numerous plates of the supra-orbital regions; the two well-defined rows of plates intervening between these, instead of only one indistinct one; the equality of the lateral and median plates in the snout frontal region; the absence of carina externally on the upper labials, or at least their more vertical sides; the inequality of the middle and lateral scales on the breast; the abrupt difference in size of the scale on the under surface and anterior edge of humerus and femur (especially the latter), instead of a gentle gradation. The femoral pores are more numerous; the large occipital plate smaller and more encircled by small plates. Other differences would doubtless be appreciable in a larger specimen.

Uma notata.

Catalogue No.	Number of specimens.	Locality.	Donor.
4124	1	Mohave Desert, Arizona	Dr. A. L. Heermann.

UMA RUFOPUNCTATA Cope.

Uma rufopunctata COPE, American Naturalist, XXIX, 1895, p. 939.

This species is represented in the collections of the U. S. National Museum by ten specimens, of which five are adult, one half-grown and four young. The description of the squamation already given in the case of the *U. scoparia* applies in the main to this species, but there are many important differences, which I proceed to enumerate.

The dorsal scales are very small and round, and not transversely diamond-shaped; in a specimen where the head and body measures 93 mm., three and a half measure a millimeter, transversely. The large scales of the front of the humerus and femur are abruptly contrasted with the smaller ones of the inferior faces of the same regions, instead of graduating into them, as in the case in the *U. scoparia*. Thus there are fifteen rows of small scales anterior to the femoral pores, instead of only five or six, as in *U. scoparia*. The femoral pores number from 24 to 28. In two specimens they are 24-24; in one, (♂)-24; in two, 25-25; in one, 26-27; in one, 27-28, and in one, 27-(♂). This irregularity has no relation to age, as the young do not differ from the adults in this respect. The number of loreal rows of scales do not differ in the specimens, and the supraorbital scales are also uniformly less numerous than in the *U. notata*, numbering eleven and twelve rows. There is one well-

developed row between the long suborbital scale and the superior labials and a few granular scales above it in two of the specimens, instead of the two well-developed rows in the *U. scoparia*. The end scales of the suborbital series are somewhat variable in number and character, but there is usually but one keeled scale posterior to the long median scale in place of the three of the *U. scoparia*. The feet are of about the same length as in the *U. scoparia*, measuring one-third the length of the head and body, or less; and they are thus distinctly shorter than in the *U. notata*. The claws of the manus are not excavated nearly so far proximad nor so deeply as in the *U. scoparia*, nor are they twisted so that the edges are directed outward, as in the latter.

In coloration this species differs widely from the *U. scoparia*. On the

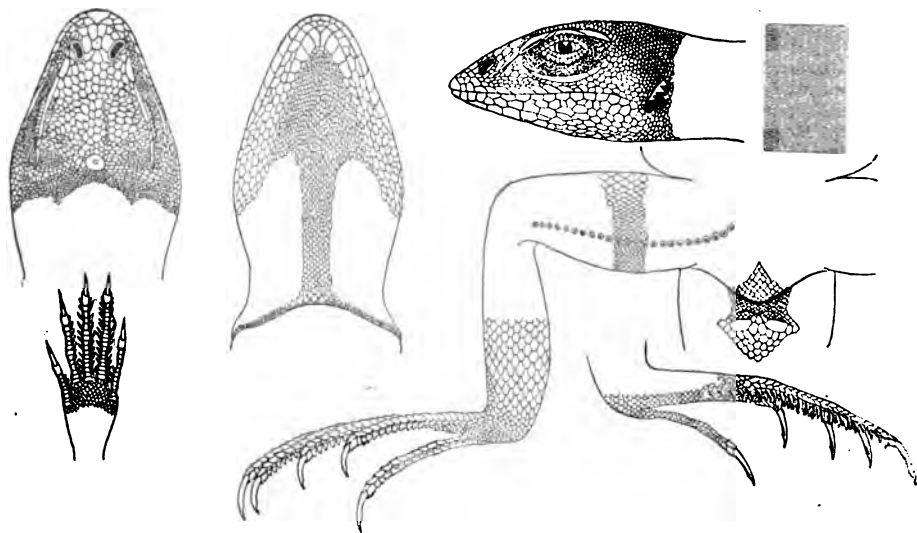


Fig 28

UMA RUFOPUNCTATA COPE.

× 2.

ARIZONA.

Cat. No. 21997, U.S.N.M.

gular region, instead of the two conspicuous transverse black crescents, there are longitudinal narrow blackish lines. There are six or seven black spots on the distal half of the under side of the tail, of which the anterior are small and transverse, the posterior longer and covering the entire inferior surface. The black lateral spot is large and is entirely inferior; its outline varies from subcircular to subquadrate. The color of the superior surfaces differs from that of the *U. scoparia*, in that the black ground remains in the form of longitudinal lines, of which there are ten or eleven. The interspaces are broken up into discoidal spaces of light yellowish-brown, their isolation being most complete near the middle line. Each discoidal space has a rusty or rufous central spot in place of the black spot of the *U. scoparia*, and it is therefore less dis-

tinct than in the latter. On the sides of the neck and body and on the superior aspect of the tail the black is broken up into small spots.

In the young the discoid areas are not well outlined, and the central spots are not distinct and are blackish. The ground-color tends to run more into irregular longitudinal lines. The paler color appears rather as the ground, and it is pea-green rather than the brownish yellow of the adult.

On the posterior faces of both femur and tibia, proximad, there is a patch of enlarged keeled scales, with the keels and their mucronate apices *directed upward*. On the lower anterior border of the humerus a row of enlarged scales presents produced apices, which are recurved, forming a serrate line, most prominent near the elbow.

The tail is very wide and is much depressed for some distance from the base, and only the terminal part is cylindric. Along the widened portion the lateral scales are imbricate, and have recurved apices, giving a rough appearance. The median superior scales are like the dorsals, smooth, not imbricate, and rounded.

Measurements.—Total length, 188 mm.; length to vent, 92 mm.; length to axilla (axial), 40 mm.; length to auricular meatus (axial), 17 mm.; width at auricular meatus, 17 mm.; width of base of tail, 18 mm.; length of fore limb, 45 mm.; length of fore foot, 16 mm.; length of hind limb, 73 mm.; length of hind foot, 31 mm.

Uma rufopunctata Cope.

Catalogue No.	Number of specimens.	Locality.	Donor.
21846 to 21852	7	Yuma Desert, Arizona	Dr. E. A. Mearns, U. S. A.
21907 to 21298	2	Gardner's Laguna, Lower California	do.

UMA INORNATA Cope.

Uma inornata COPE, American Naturalist, XXIX, 1895, p. 939.

Specimen Cat. No. 16500 represents perhaps a fourth species, which agrees in most respects with the *U. rufopunctata*, but differs in the number of femoral pores and in coloration; is immature and about the size of the one which served as the type of the *U. notata* of Baird. It was caught on the Colorado Desert of San Diego County, California, at a distance of from 100 to 140 miles south of the Mohave Desert of Arizona where the type of the *U. notata* was taken.

In the character of its coloration it resembles the *U. notata* and the young of the *U. rufopunctata*, except in the absence of the conspicuous black spot on each side of the belly, which is present in every individual of this genus hitherto discovered. In its squamation it resembles rather the *U. rufopunctata* than the *U. notata*, and like it, unlike the

latter, it has a short hind foot, which is only one-third the length of the head and body. It agrees with the same species in the reduced number of loreal and supraorbital scales, and the larger number of small scales on the inferior face of the femur. There are seven black spots on the inferior side of the tail, the anterior smaller than the posterior. Femoral pores 19, as in *U. notata*.

Uma inornata Cope.

Catalogue No.	Number of specimens.	Locality.	Donor.
16500	1	Colorado Desert, San Diego County, California..	C. R. Orcutt.

UMA SCOPARIA Cope.

Uma scoparia COPE, American Naturalist, XXVIII, 1894, p. 435, figs. 3, 4.

Uma notata COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 310; not of Baird.

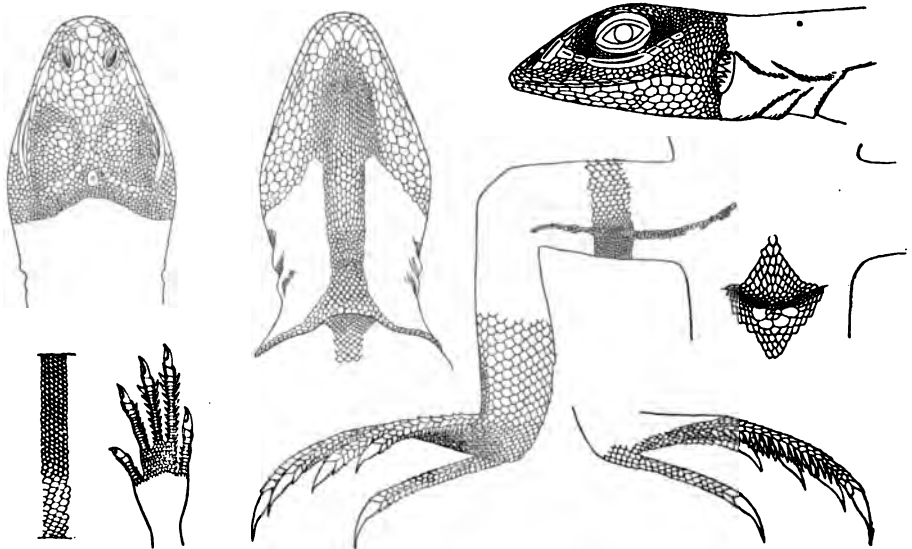


Fig. 29.

UMA SCOPARIA COPE.

× 3.

Tucson, Arizona.

Cat. No. 6063, U.S.N.M.

General form depressed. Prebrachial region rather elongate; posterior part of abdomen expanded posteriorly. Tail of medium length, depressed throughout, and very wide for the basal half, equaling at its base the width at the groin. The fore limb extended posteriorly just reaches the groin; the end of the longest toe of the hind limb when extended reaches the posterior border of the orbit. The length from the extremity of the muzzle to the axilla equals the length from the

latter to the posterior border of the femur. The upper lip has a sub-acute median angle which projects beyond the lower lip. The profile descends in a nearly straight line to the depressed and slightly prominent border of the muzzle. The fifth finger extends a little beyond the extremity of the first, and the extremity of the fifth toe marks a point between the extremities of the first and second.

There are thirty-two femoral pores in a continuous line and a second series immediately posterior to it, in which we can count fifteen additional pores. Of these, ten near the middle of the series are consecutive.

There are two rows of rather small frontal scales which posteriorly follow the orbital border, and are separated from the rather small occipital by two rows of smaller scales. There are about eleven rows of scales on the supraorbital region, which are smaller than the frontals, excepting three rows inside the center of the region. The scales on the muzzle are larger, nine rows intervening between the canthal rows at the middle. Four rows between the nostrils. Canthal row consisting of one long and one small scale, the latter below the nostril. Six loreal rows. Six infraorbital plates, the third below the orbit and much longer than the others, and, like them, keeled. Three supercillaries in front of and three posterior to the median or key scale. Superior labials oblique, overlapping each other forward above and obtusely keeled longitudinally. Scales of the quadrate region rather small. Auricular meatus protected by six elongate free scales which spring from the anterior border. The meatus is about equal in vertical diameter to the eye slit. Inferior labial scales smooth, in contact below with a series of infralabials which exceed them in size, which become posteriorly several rows. Gular scales small, a little larger at the middle of the throat. All the scales of the head smooth.

The dorsal scales are small, smooth, smaller than those of the belly, and transversely diamond-shaped. The scales of the inferior surface are smooth, and are arranged in open chevrons with the angle forward. The greater number are parallelogrammic, but the anterior are regularly diamond-shaped. Those of the anterior pectoral region are reduced in size, and are smaller than those of the posterior gular region. The latter are similar to the edge of the collar, except four scales in the middle, which are a little larger. Collar with uniform border. There are some longitudinal folds on the side of the neck, but as the specimen has been somewhat dried, it is not certain whether they are present in life. The scales on the anterior faces of the humerus and femur are enlarged and their acute apices are free and more or less recurved. They graduate into the other scales on the humerus, which are rather larger than those of the dorsal region. On the femur they graduate into those of the inferior side, which are larger than those of the dorsum, but are separated rather abruptly from those of the superior face, which equal those of the dorsum. The scales of the tibia are about equal to those of the belly. A few rows on the

internal border are keeled and have their elongate apices directed upward. With this exception the scales of the limbs are not keeled.

The inferior scales of the digits are not keeled or conspicuously angulated. The lateral rows are produced into free flat spinous processes on the three middle fingers, and on the adjacent (inner) side of the fifth. On the toes the fringes are conspicuous on the third and fourth, and are wanting on the first and fifth toes. On the second they are present, but less elongate on the side next the third, and on the inner side are only present near the extremity. They extend on the external border of the sole to near the base of the fifth digit. The terminal exterior scale is much enlarged and folds over the inner edge of the basal half of the claw. It is obliquely truncated, distally presenting a prominent angle at the internal corner, which is pinched and acute. The superior scale in like manner enfolds the external edge of the unguis, and has a pinched external border which terminates in an acute apex. The two form a conspicuous basal sheath. The inferior plate is longitudinally ridged, while the superior is smooth. Each unguis is excavated for the distal half of its internal inferior surface, giving a thin, sharp interior edge to the claw.

Measurements.—Total length, 217 mm.; length to vent, 100 mm.; length to line of axillæ, 47 mm.; length to collar, 30 mm.; length to line of anterior border of ear, 21 mm.; length of anterior limb, 45 mm.; length of anterior foot, 17 mm.; length of posterior limb, from groin, 77 mm.; length of tibia, 27 mm.; length of posterior foot, 30 mm.; width of head at auricular meatus, 16 mm.; width at shoulders, 23 mm.; width of base of tail, 18 mm.

The ground color of the upper regions is black, and of the lower, apparently white. The dorsal region is covered with disciform round spots of white (or possibly yellow or red in life), whose borders nearly or in some places quite touch. In the center of each disk is a black spot. The pattern resembles that of the pieces of a buttonmaker's refuse. On the neck and occiput the pale disks become confluent, and the superior surface of the head, from the posterior border of the orbits forward is a uniform dirty white. On the ends the pale disks are confluent, leaving series of rather numerous small black spots. On the upper surface of the tail the disks are confluent longitudinally, leaving some longitudinal black lines. The greater part of the tail is pale, and is very indistinctly marked. The limbs are pale, with minute black specks on the superior aspect of the humerus and femur. On the throat is a black crescent, with the horns turned anteriorly and terminating below the external meatus of the ear. Posterior to this is another black crescent of greater transverse extent, whose horns terminate between those of the anterior crescent and the auditory meatus. Sides of head and neck black spotted. Inferior surfaces unspotted, with the following exceptions: On each side, halfway between axilla and groin, a large subround black spot. On the inferior surface of the tail, on the

distal third, four black spots. The anterior is round, and the others increase in length to the fourth, which is elongate.

This species, the most peculiarly marked lizard of North America, differs in numerous respects from its congener, the *Uma notata*, with which I at one time identified it. Thus, the number of femoral pores is more than twice as great; the labial plates are keeled; the digits and claws are shorter, and the latter are not excavated farther proximally; the transition from the small to the large scales of the humerus and femur is gradual and not abrupt; the fringes of the borders of the eyelids are of equal length, the inferior not being longer, as in *U. notata*; and finally, the fringes of the digits and sole are longer in the *U. scoparia* than in the *U. notata*.

Uma scoparia Cope.

Catalogue No.	Number of specimens.	Locality.	Collector.	Character of specimen.
6603	1	Fort Buchanan (Tucson), Arizona.	Dr. B. J. D. Irwin, U. S. A . . .	Alcoholic.

HOLBROOKIA Girard.

Holbrookia GIRARD, Proc. Amer. Ass. Ad. Sci., IV, 1851, p. 201; Stansbury's Exp. Gr. Salt Lake, 1852, p. 341.—A. DUMÉRIL, Arch. Mus., VIII, 1856, p. 545.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 160.—BOULENGER, Cat. Liz. Brit. Mus., VII, 1885, p. 207.

Cophosaurus TROSCHEL, Arch. f. Nat., 1850, [issued 1852], p. 389.

A gular fold of large scales, sides of neck variously plaited. Scales above and on sides small, nearly even, considerably less than the ventral, all rhomboidal, imbricated. Tail moderate, not brittle. Femoral pores distinct. No external ear. Nostrils superolateral, anterior to the end of the canthus rostralis. A large infraorbital plate. Upper labials very oblique, imbricated. Head plates, including interparietal, small. Tongue barely notched at tip, with two sessile subtriangular pallets beneath. No palatines. Cheek teeth conical, posterior only faintly tricuspid.

This genus has a distribution throughout the Sonoran district extending nearly to Oregon on the north, and entering the Central district as far as Kansas inclusive. It is abundant in Texas, but is wanting from the Pacific and Lower Californian districts, where its place is supplied by *Callisaurus*. The species are not numerous, and are as follows:

- I. Tail flattened, longer than head and body. Frontal scales larger than supraorbitals; postinfralabials few.
Hind foot one-half length of body; tail with black spots below; male with black crescents on the sides. *H. texana*.
- II. Tail cylindric, longer than head and body. Frontal scales smaller than supraorbitals; postinfralabials many.
Hind foot three-fifths length of body; no spots on under surface of tail; sides with oblique black spots; scales minute *H. propinqua*.

III. Tail cylindric, shorter than head and body. Scales as in II.

Hind foot two-fifths length of body; black spots present or absent on tail; two small ones on each side; a few larger supraorbitals *H. maculata*.

Hind foot one-half length of body; no lateral or caudal spots; numerous larger supraorbital scales..... *H. elegans*.¹

Of these species the *H. maculata* is much the most variable, as many as four subspecies having been pointed out. It has also the widest range, extending throughout the Central and Sonoran districts and the Texan subdistrict. *H. texana* inhabits the Sonoran district and the Texan subdistrict, while the *H. propinqua* inhabits a restricted southwestern region of Texas.

HOLBROOKIA TEXANA Troschel.

Holbrookia texana BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, August, 1852, p. 125 (San Pedro, Texas); U. S. Mex. Bound. Surv., Rept., 1859, p. 8, pl. XXX.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 163.—COPE, Bull. U. S. Nat. Mus., XVII, 1880, p. 14.

Cophosaurus texanus TROSCHEL, Wiegman's Archiv., f. Naturges., 1850 (published 1852), p. 389, pl. VI.

Holbrookia affinis BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, August, 1852, p. 125 (San Pedro).—BAIRD, U. S. Mex. Bound. Surv., 1859, p. 8.—BOCOURT, Miss. Sci. Mex., Rept., 1874, p. 163.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 207.

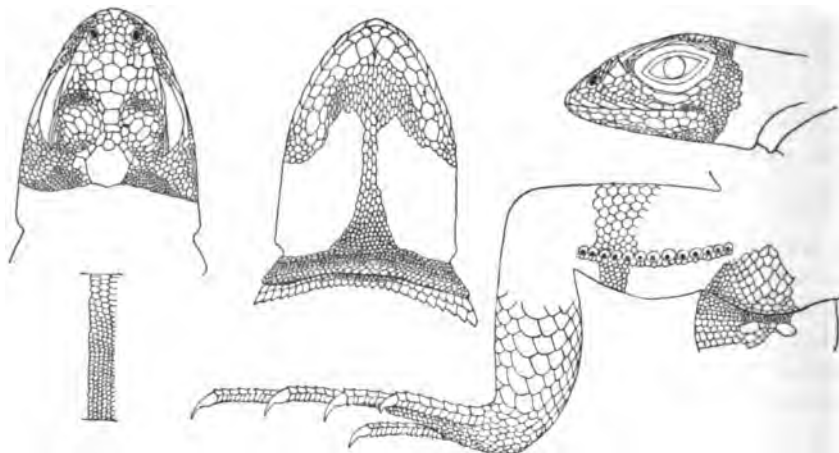


Fig. 30.

HOLBROOKIA TEXANA TROSCHEL.

× ½.

El Paso, Texas.

Cat. No. 2666, U.S.N.M.

Hind feet lengthened, nearly half the head and body. Femoral pores sixteen or seventeen. Color above, olive gray. The back with ten series of dorsal rounded blotches, which on the tail become rings; black below, although frequently only obsoletely indicated. Posterior half of sides

¹ Bocourt; Mazatlan.

with two black crescents, widening below; the posterior double its own width from the groin, from which sometimes springs a third. The interstices and borders lighter than the ground color on the sides above; below and on the belly blue. Chin mottled with blue and white. Sides anterior to the crescent spotted with whitish. Thighs with a plumbeous stripe behind.

In this species the scales of the entire back are rather larger than those on the sides for a width of at least twenty scales. The number in a line from occiput to above anus is at least one hundred and sixty. The hind foot is rather more than two-fifths the head and body; the free portion of hind toe one and one-half times the head. There are seven upper labials on each side. The tail is very much depressed to the tip.

The upper parts of this species are of an olivaceous or reddish gray. The back with the series of nine or ten small, dusky rounded blotches, sometimes very obsolete; continued on the upper surface of the tail as a single series of undulating or somewhat W-shaped bars. All these marks are suffused behind with a lighter tint than the ground color. In the posterior half of each side are three parallel black crescents, extending from back to belly, the convexity posterior; the extremities of opposite ones separated above and below by ten or twelve scales; of these the posterior starts from the groin and is quite indistinct; the two others are widest inferiorly (where they are truncate), and taper almost to a point on the back. The borders and intervals of these crescents are generally yellowish, lighter than the ground color. Anterior to the crescents the sides are conspicuously and quite uniformly marked with rounded, yellowish spots, almost in a network of the ground color; they sometimes have a darker areola. The under parts are yellowish, suffused with greenish on the sides of belly (especially about the black marks) and sometimes across it. The head has sometimes a greenish or light plumbeous tinge; the under part of the head is faintly blue, varied with yellowish. The under surface of the tail shows from three to eight conspicuous, transverse, large bluish or black spots in continuation of rings encircling the tail, which are quite indistinct above and laterally. The posterior surface of the thigh shows a broad, longitudinal plumbeous stripe, and below it a yellowish one, cutting off a second fainter lead-colored one, sometimes wanting.

The rings around the tail are more indistinct laterally than above.

The female has a series of plumbeous blotches along the sides, nearly as broad as high, subcrescentic, with the tips truncate and close. There are two oval spots on the side of the belly, and in its white ground, just below two of the lateral blotches mentioned.

Sometimes there is a trace of an additional crescent (or even two) anterior to the others. This, however, is only faintly indicated; is not continuous, and does not extend on the belly.

Professor Baird distinguished a *Holbrookia affinis* as distinct from the *H. texana*, but I find the following note in his manuscript:

The difference between the typical *H. texana* and the supposed species *H. affinis* will be found indicated, as far as I have been able to appreciate them, under the latter head. I must confess, however, a very great difficulty in assigning many specimens to one rather than to another of these species.

He then defines the typical *H. texana* as follows:

Legs rather short, the hind foot little more than one-third length of head and body; femoral pores, twelve or thirteen. Above olive gray, with ten dorsal series of rounded dusky blotches, which on the tail behind anus become six or eight rings, intensely black below. Posterior half of sides with ten long crescents widening below, the posterior twice its width from the groin; the interspace and border lighter on the sides above, but below and on the belly blue. Sides anterior to the crescent spotted with whitish. Chin strongly mottled with blue and white; thigh behind with a longitudinal plumbeous stripe; a black spot on shoulder, and one or two behind it on humerus. Female with the lateral crescents replaced by oval spots.

In some specimens of *H. texana* (Cat. No. 2669) there is a tendency to a continuation of the lateral crescent in a series of rapidly diminishing, broad, subquadrate, plumbeous, crescentic blotches close together, of which four may be counted to above insertion of hind legs, continued as broad stripe almost halfway along the side of tail. This is more evident in females than males.

The *Holbrookia affinis* is defined as follows:

This species differs from *H. texana* in several points, chief among them the larger size of the dorsal scales and the greater length of limbs. Those in *H. texana* are scarcely larger on the back than on the sides; and the arrangement into oblique series can hardly be observed. There are about one hundred and seventy-five of the scales from head to above anus. In *H. affinis* there are one hundred and fifty scales in the same distance; larger and more regularly rhomboidal. The free portion of the hind toe in *texana* is only about $1\frac{1}{2}$ the length of the head above from snout to end of occiput, and equal to the length from snout to end of jaws or of large lateral plates on the cheeks. In *H. affinis* this is one and one-half times the length of head and one and one-fourth or one and one third times length of side of jaw. The scales on the upper face of the thigh appear more abruptly smaller than the anterior ones in *texana* than in *affinis*.

There appears to be little difference in coloration. The bands beneath the tail appear more distinct in *H. texana*, more tinged with the blue of sides and chin deeper. The crescents on the sides are farther back in *H. affinis*; the posteriors are separated from the groin only by its own width, instead of twice this amount. The edge of the anterior crescent in *texana* reaches about two-fifths from fore to hind leg, instead of only about one-third, as in *affinis*. *H. texana* exhibits no trace of a third crescent springing from the groin. It, however, has a conspicuous black spot on the shoulder, with one or two behind it on the anterior face of humerus, very indistinctly seen in specimens of *H. affinis*.

It is, however, evident that there is really but one species, as many specimens are so strictly intermediate as to render it very difficult to say where they should be assigned. In the largest individuals, however, the average of characters as assigned is generally preserved.

This lizard is the characteristically abundant form of western Texas. I found it in the first plateau country to the heads of the Medina and Upper Llano. Mr. Boll states that it does not range east of Fort Worth, in northern Texas. I did not observe it in the low country of Washington County. It evidently belongs to the plateau fauna. It runs with great rapidity, with its tail generally curved upward, displaying the black spots on the lower side. It prefers rocky ground, and does not ascend trees under ordinary circumstances.

Holbrookia texana ranges over part of the Sonoran subregion at least. I have taken it at Lake Valley, New Mexico, and E. Wilkinson at the city of Chihuahua. The western limit of its range has not been determined.

Holbrookia texana Troschel.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2676	1	Western Texas	Dr. S. W. Woodhouse	Type.
4857	2	Pecos River, Texas	J. K. Townsend	Alcoholic.
4914	2	Newwied, Texas	Prof. L. C. Krvendberg	do.
2659	7	San Pedro, Texas	Col. J. D. Graham, U. S. A.	do.
2666	3	El Paso, Texas	J. H. Clark	do.
2663	2	Castanuelas, Mexico	Lieut. B. Couch, U. S. A.	do.
2787	1	California	Dr. W. Gambel	do.
2822	1	Monterey, New Leon	Lieut. B. Couch, U. S. A.	do.
2672	1	San Antonio, Texas	Dr. C. B. R. Kennerly	Type.
2677	1	Alamos de Parros, Mexico	Lieut. B. Couch, U. S. A.	do.
2660	2	San Antonio, Texas	Dr. C. B. R. Kennerly	do.
15460	.....	San Diego, Texas	W. J. Taylor	do.
22152-3	.....	Waco, Texas	H. and C. Brimley	do.

HOLBROOKIA PROPINQUA Baird and Girard.

Holbrookia propinqua BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, August, 1852, p. 126 (Indianola to San Antonio).—BOCOURT, Miss. Sc. Mex., Rept. 1874, p. 162.—COPE, Bull. U. S. Nat. Mus., No. 17, 1880, p. 15.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 208.

Scales on back very small. Not appreciably larger than those on sides. Head flattened; plane from middle of orbit to snout, narrow; longer than broad. Hind foot two-fifths the head and body; free part of largest toe considerably longer than cephalic plates. Temporal plates large, few in number; fully equal to those margining under labials behind. Upper labials seven.

Above olive or ashy gray or green, with dorsal blotches, color generally similar to those of *H. maculata*, but the lateral spots (in anterior half of sides) are more elongated vertically, and extend into the gray of the sides. They are scarcely visible from below.

Holbrookia propinqua is easily distinguished from other species of the genus. The tail is slender, cylindric, and longer than the head and body; the hind foot is elongate, being two-fifths the length of the head

and body. Ten or more supraorbital scuta; plates of muzzle flat; labials exceedingly narrow, five in number, followed by a flat one. Femoral pores 16-18. A pair of blue spots on the side; none under the tail.

This species, in addition to the general characters of the type *H. maculata*, differs in the excessive minuteness of the dorsal scales, which can scarcely be counted, even with a good lens. The head is more elongated and quite plane from above the end of the eye, instead of slightly convex. Its width reaches only from the end of snout to middle of occipital, instead of behind it. There are seven oblique upper labials instead of six. The legs are all much longer; thus the hind foot is decidedly more than two-fifths the head and body instead of only one third or even less (two-sevenths). The free portion of hind

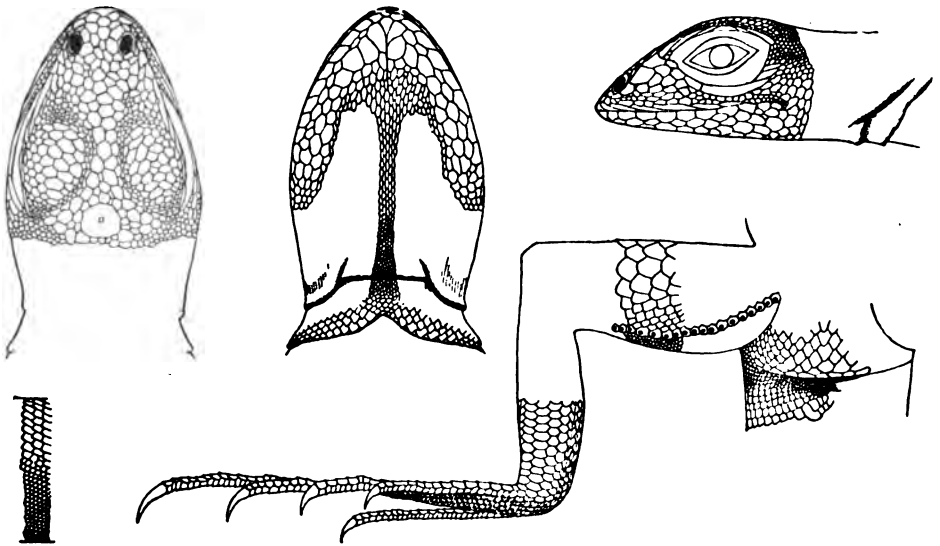


Fig. 31.

HOLBROOKIA PROPINQUA BAIRD AND GIRARD.

× 3.

Cat. No. 18659, U.S.N.M.

toe reaches far behind the occipital plate from snout, instead of only to about its middle. The plates on lower jaw margining the under labials are smaller, those on the temples fewer and larger, the two series being about equal; in *H. maculata* the case is reversed, and the upper plates are smaller and more numerous.

The coloration is much the same. The indigo-black patches on the sides, however, are much more lengthened, forming short, oblique crescents, running up into the gray of the sides, the convexity anterior. They are about four times as long as wide, instead of mere oval blotches. There is very frequently a third, more posterior and less distinct, one. The female has quite a decided light stripe between the fore and hind legs, the lateral bars more vertical, shorter, and less distinct.

The posterior edge of the hinder blotch is just half way between the fore and hind legs.

Specimens from the lower Rio Grande differ from the types from near Indianola in lighter colors, less conspicuous mottling on chin, and still flatter and more depressed head. The cephalic plates are more flattened and less pyramidal; the tail longer.

I did not observe the *H. propinqua* in any part of Texas visited by myself. Mr. Marnock finds it abundant near Helotes, and Professor Baird's types came from south of San Antonio. It is doubtless a southwestern species.

Holbrookia propinqua.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
4954	2	Pecos River, Texas	Capt. John Pope, U. S. A.	Alcoholic.
2788	1	Ringgold Barracks, Texas	Dr. Thos. Webb	do.
5187	1	Fort Stockton, Texas	P. Duffy	do.
2671	6	Indianola, Texas	Col. J. D. Graham, U. S. A.	do.
2665	6	Castanuelas, Mexico	Lieut. B. Conch. U. S. A.	do.
2654	2	Alamos de Parros, Mexico	do	do.
2817	16	Laredo, Texas	A. Schott	do.
15659	.....	San Diego, Texas	W. J. Taylor	do.

HOLBROOKIA MACULATA Girard.

Holbrookia maculata GIRARD, Proc. Amer. Assoc. Adv. Sci., IV, 1851, p. 201; Stansbury, Report, 1852, p. 342, pl. IV, figs. 1-3, Reptiles.—BAIRD and GIRARD, Marcy Red River, 1853, p. 236.—HALLOWELL, Proc. Acad. Nat. Sci. Phila., VIII, October, 1856, p. 239.—A. DUMÉRIL, Arch. Mus., VIII, 1856, p. 546.—BOCOURT, Miss. Sc. Mex. Rept., 1874, p. 161, pl. XVII bis, fig. 7.—COPE, Bull. U. S. Nat. Mus., XVII, 1880, p. 15.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 209.
 ——— *approximans* BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 253.—BOCOURT, Miss. Sc. Mex. Rept., 1874, p. 163.

Scales on back rather large, wider for 6 or 8 scales, then more laterally; about 125 from head to anus; head broad, very short and convex; the lateral profile of upper part gently or rapidly convex to the mouth. Upper labials six; temporal plates smaller than those on the side of chin. Hind toe about one-third the head and body; free portion of its longest toe equal to length of cephalic plates.

Above olive or ashy gray or green with sometimes a dorsal series of subquadrate dark blotches into lighter areola. Beneath white, the tail beneath without bands. A whitish stripe from eye along the sides below the dorsal blotches. A second less distinct from mouth in line with lower edge of colored sides. Both sometimes broken up into small spots also seem more or less thickly on sides and above. Two oval indigo-black spots in anterior half of each side scarcely visible from below.

There are four subspecies of this species, which differ as follows:

- I. Snout more pointed; anterior supralabials narrower; muzzle plates smaller. Under surface of tail black spotted; no black spots on sides; dorsal spots large, transverse, yellow bordered, digitate posteriorly *H. m. lacerata*. Spots absent or rarely present on inferior side of tail; two small ones on each side; dorsal spots small *H. m. maculata*.

- II. Snout shorter; anterior supralabials broad, prominent; muzzle plates larger.
 Dorsal spots distinct, back not yellow speckled; lateral spots posterior and inferior *H. m. approximans*.
 Dorsal spots obscure or wanting, back yellow speckled *H. m. flavilenta*.

These subspecies have definite geographical ranges. The *H. m. lacerata* belongs to central Texas; the *H. m. maculata* to the central district generally and northern Texas. *H. m. approximans* is the Sonoran representative; while *H. m. flavilenta* is found in western New Mexico and Arizona, excepting the desert region of the extreme south, according to Stejneger.¹

HOLBROOKIA MACULATA LACERATA Cope.

Holbrookia maculata lacerata STEJNEGER, N. Am. Fauna, No. 3, 1890, p. 109.

Holbrookia lacerata COPE, Bull. U. S. Nat. Mus., No. 17, 1880, p. 15.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II., 1885, p. 209.

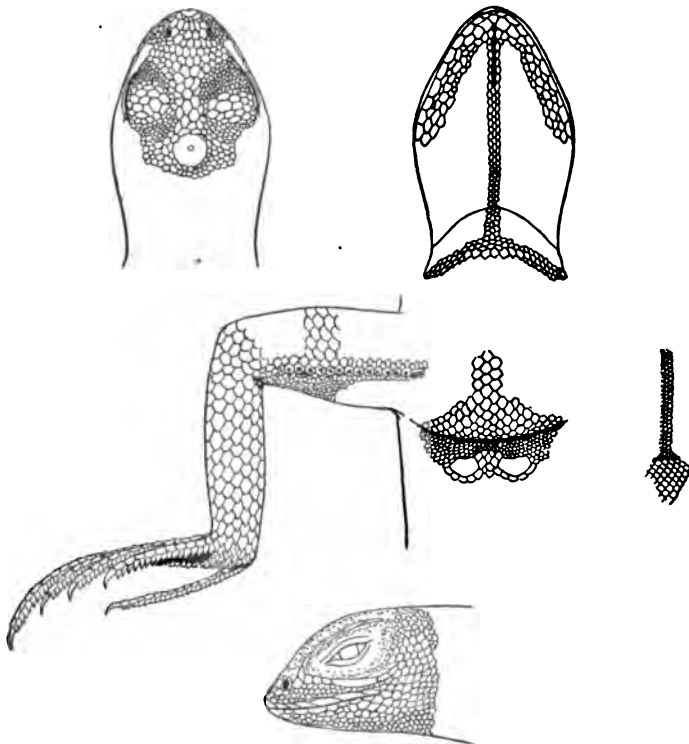


Fig. 32.

HOLBROOKIA MACULATA LACERATA COPE.

× 2.

Cat. No. 13621, U.S.N.M.

Tail cylindric, slender, a little longer than body; hind foot short, less than one-third of head and body; six or eight supraorbital scuta sur-

¹ North American Fauna, No. 3, 1890, p. 109.

rounded by minute tubercles; scales of muzzle tubercular. Labials less elongate, five oblique, one flat; femoral pores 12-13; no blue spots on the sides; transverse blue spots on the inferior side of the tail. Color light brown, with six pairs of transverse dark-brown bars between the scapular region and groin, which extend downward and backward on the abdomen. Their posterior border is serrate or digitate, and edged with yellowish, producing a variegated pattern. The inner part of the spots is frequently cut entirely off. The spots are continued on the upper side of the tail, and there are six irregular longitudinal brown bars on the neck. A brown band across supraorbital regions, and spot on upper surface of muzzle. Limbs brown cross-banded. A pale band on inferior part of side, which is crossed by the ends of the lateral spots. Below this are five or six small dark spots, sometimes obsolete. Total length, 99 mm.; to collar, 15 mm.; to vent, 56 mm. This is a short-legged species allied to the *H. maculata*, but with longer tail and very different coloration. As compared with the variety of *H. maculata*, above described, the labial scuta are shorter and less oblique, resembling more nearly those of *H. texana*. In coloration it differs from the *H. maculata* in a point not above mentioned. The dorsal ground color is everywhere the same, a rich yellowish brown. In the *H. maculata* the median dorsal region is paler, and the sides of the back are of a dark shade, which connects the spots as by a wide band.

The most northern locality for the *Holbrookia lacerata* with which I am acquainted is in Erath County, west of the Upper Brazos. Mr. Boll found it rather abundantly there and in Comanche County. Southward it has been found by Mr. Marnock on the Guadalupe River in Kendall or Comal County. It thus belongs to the first plateau fauna, and is not widely distributed.

The specimens above mentioned do not exhibit lateral spots, but they are present on the following specimens, which have been received by the Smithsonian Institution:

Holbrookia maculata lacerata Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
4993	3	Neosho, Kansas		Alcohol.
22146-9	3	Waco, Texas	H. H. and C. S. Brimley	do.
22150-1	2	China Springs, Texas	do	do.

HOLBROOKIA MACULATA MACULATA Girard.

In this subspecies the body is moderately stout and depressed; much more so in the females. The head is broad and short, as wide as long, pointed anteriorly to the broad and rounded muzzle. The lateral outline of the head is very convex posteriorly, then slopes from the middle to the head nearly in a straight line to the line of the mouth.

The head above is covered by small polyhedral or pyramidal plates, except on the supraorbital region. The occipital plate is large and polygonal, the edges are raised, and it has also a central tubercle; it is situated in the midst of small plates, of which there are two series to the supraorbitals. There are two small vertical plates in line, but anterior to these there is no regular arrangement, the most symmetrical specimen showing one plate in the center of a circle of seven others, and then four median in line to rostral. There are, however, three series of hexagonal plates above the eye parallel to the inner border of small plates; anterior to which the plates on the supraorbital region are smaller than elsewhere on the upper surface of head. The eyelids are granular, with a series of longer flat plates along the edge. The

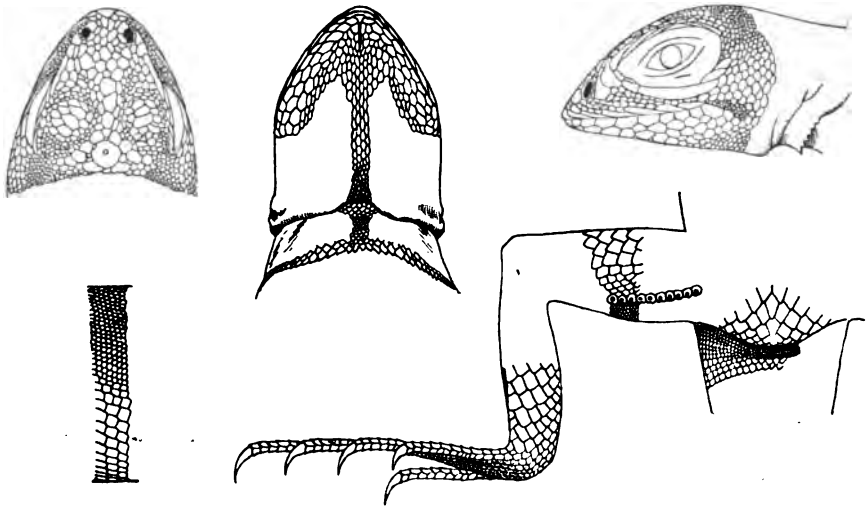


Fig. 33.

HOLBROOKIA MACULATA MACULATA BAIRD AND GIRARD.

× 8.

Fort Kearny to Laramie, Wyoming.

Cat. No. 9366, U.S.N.M.

loral and supralabials are small and tubercular. The nostrils are superior, situated in a single plate, except anteriorly, but closely surrounded by others which appear to form their outer border.

The scales of the back and sides are all excessively small, almost granular. Those on the central line of the back for six or eight scales being rather larger (by an insensible gradation) than the others, and are quite distinctly but obtusely carinated; the lateral scales around the base of the tail are all similar to the dorsal. The scales immediately back of the head are smaller than elsewhere on the back. About one hundred and twenty-five scales can be counted, as nearly as may be, from head to above arms. The belly scales are rhomboidal, decidedly larger than any of the dorsal; they are rhomboidal and smooth. Those in front of arms

are largest. The plates on the side of the chin (one row anteriorly, three behind), margining the lower labials are hexagonal, paved, and much larger than the intervening ones, as are also those on the temples. There are two transverse folds on the throat, the covered portions of which are lined with smaller scales, the narrow space between the two being covered with large rhomboidal scales like those on the breast. The scales between the fore legs are perhaps larger than those on the belly; those covering the shoulder considerably so. All the scales on the body are arranged in quincunx, except on the belly and beneath the tail, where they are in transverse series of small, nearly square, alternating plates. The scales on the under and inner surface of the hind leg are larger than elsewhere, especially on the tibia. Those on the shoulder and inside of forearm are also large. The male has two plates behind the arms not seen in the female. The femoral pores are distinct.

In the alcoholic specimen the upper parts are ashy gray. On each side the back is a series of U-shaped blotches, the convexity posterior; sometimes angular or emarginate behind; some 8 or 10 pairs from head to above anus. Those blotches anteriorly are somewhat obsolete or not filled up; they are bordered behind (sometimes all round) by a light yellowish suffusion or spotting, lighter than the ground color. In some specimens there is a narrow, horizontal, light line from the orbital region above the arms and below the edge of the dorsal blotches fading out on the sides. This sometimes forms the dividing line between another lateral series of blotches corresponding with the dorsal; this series is, however, generally obsolete or else broken up with obscure mottling, the posterior border of light suffusion or spottings indicating the position of the blotches. The sides occasionally show minute points of whitish. The dorsal blotches are continued in two series on the thickened portion of the tail; the attenuated portion, however, is usually plain gray. The under parts are yellowish white. The jaws with transverse bars of plain bluish, continued obliquely backward on the under surface of the head, which is variously mottled with the same. On each side below and adjacent to the outer edge of the belly are two very distinct indigo-black blotches with a suffusion of bluish around them. These are rather elongated transversely, placed one in advance of the other, and both situated in the posterior extremity of the anterior half of the region from fore to hind legs. They do not extend up the side as far as the lower lateral dusky blotches.

In some specimens there is a decided indication of a second light stripe on the side of the neck, continuous with the light edge of the upper jaw and extending, with several interruptions, to the arm. The upper surface of the limbs is transversely banded with dusky. The posterior surface of the thigh is without conspicuous marking.

The female differs very little, if at all, in color, although possibly the markings above are more obsolete.

There is sometimes, but very rarely, a third spot on the sides behind the others; as also a trace of a light yellowish line on the flanks, extending between the legs.

The hind feet are short, being barely more than one-third the distance from snout to arm, the free portion of longest toe not reaching from snout to end of large occipital.

Specimens from western Texas are larger and much sprinkled, sometimes all over, with small rounded white spots, the dark blotches even being at times entirely wanting. The ground color in these, as from all localities, varies from dark to light ashy, with sometimes even a tinge of reddish brown. Some of these more Southern and Western specimens (Cat. Nos. 2813, 2771, etc.) seem to have the upper labial and radial plates projecting more horizontally all round, so as to form a kind of rim or shelf. In fact, it is quite possible that Cat. No. 2813 may belong to a species different from any here described. Compared with types from the Platte, the plates of the head above are larger, those on the anterior portion of the supraorbital space being nearly equal to those between the orbits, instead of conspicuously smaller. The head is narrower, more pointed, and less convex; the scales on the cheek and inside of the thighs larger and more equal; the legs and tail longer. If not distinct, this may at any rate be considered as a variety.

I did not observe this species in the parts of Texas I examined, but a variety of it with a longer tail than the usual form was obtained from Mr. Boll, who probably took it near Dallas. Its characters are: Tail slender, cylindric, a little longer than body; hind foot less than one-third head and body. Eight or ten supraorbital scuta; scales of muzzle tubercular; labials very narrow, five; femoral pores thirteen. A pair of blue spots on the side; none under the tail. West of Dallas, Messrs. Boll and Isaac obtained this species from Weatherford to Fort Concho, and Mr. Isaac sent it from the Wichita country. Professor Baird records it as found between San Antonio and El Paso.

Holbrookia maculata maculata.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2771	1	San Antonio, Texas .....	.....	Col. J. D. Graham, U. S. A.	Alcoholic type.
8479	1	Santa Fe, New Mexico ..	June —, 1874	H. W. Henshaw	Alcoholic.
4853	2	Pecos River, Texas .....	.....	J. K. Townsend	do.
4954	2	do .....	.....	Captain Page	do.
8460	1	Abiquin, New Mexico ..	Sept. —, 1874	G. Thompson	do.
8477	2	San Ildefonso, New Mexico.	Aug. —, 1874	Dr. H. C. Yarrow	do.
8521	2	Santa Fe, New Mexico ..	June —, 1874	H. W. Henshaw	do.
8523	3	New Mexico	Oct. —, 1874	Dr. O. Loew	do.
8522	4	do	Oct. —, 1874	G. Thompson	do.
8478	4	Plaza del Alcalde, New Mexico.	Aug. —, 1874	Dr. H. C. Yarrow	do.
8480	1	Camp Crittenden, Arizona.	Aug. —, 1874	J. H. Rutter	do.
8525	2	Cave Spring, Arizona ..	July —, 1874	H. W. Henshaw	do.
8154	3	Arizona	— —, 1871	F. Bischoff	do.
8526	1	Cienegua, Arizona	Aug. 23, 1874	J. H. Rutter	do.
5025	3	Fort Buchanan, Arizona	.....	J. Xantus	do.
8169	1	Arizona	— —, 1871	Exp. W. 100 M.	do.

Holbrookia maculata maculata—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
9366	14	Fort Kearney to Laramie, Nebraska.	.....	Dr. J. G. Cooper	Alcoholic.
4867	1	Nebraska	.....	Dr. W. L. Jones	do.
8524	2	Colorado Springs, Colorado.	July —, 1874	John Yarrow	do.
5055	8	Platte Valley .....	.....	Capt. J. H. Simpson, U. S. A.	do.
9365	1	Fort Bridger, Wyoming	.....	C. Drexler	do.
8182	1	Utah .....	.....	Exp. W. 100 M	do.
6277	2	(?) .....	.....	(?) .....	do.
9367	3	Utah .....	.....	.....	do.
8636	1	Utah .....	.....	Dr. H. C. Yarrow	do.
8637	2	Dome Canyon, Nevada.	— —, 1872	do.	do.
9283	1	Fort Tejon, California.	.....	.....	do.
9631	2	Colorado Chiquita, New Mexico.	July 30, 1872	Dr. C. G. Newberry	do.
9632	1	Apache, Arizona	— —, 1872	H. W. Henshaw	do.
2809	1	Santa Rita .....	.....	Dr. Thos. Webb	do.
2773	1	Red River Exp .....	.....	Capt. R. D. Marcy, U. S. A.	do.
2798	1	Platte River .....	.....	.....	do.
2687	5	Sonora .....	.....	Col. J. D. Graham, U. S. A.	do.
2602	3	San Pedro, Texas .....	.....	do.	do.
14749	1	Fort Huachuca, Arizona	.....	Lieut. H. C. Benson	do.
17559	1	Fort Supply, Oklahoma	.....	Dr. T. E. Wilcox	do.
21259-65	6	Long Pine, Nebraska	.....	U. S. Fish Commission.	do.

HOLBROOKIA MACULATA APPROXIMANS Baird.

Holbrooki maculata approximans BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 253.—BOCOURT, Miss. Sci. Mex., 1874, p. 163.

Body squat, depressed. Tail shorter than body. General form of *H. maculata*. Head swollen, as broad as long; profile very convex. Upper labials, six. Large plates on temples, smaller than those marginating lower labials behind, the labials thickening. Scales rather large; about one hundred and thirty from head to above anus; largest in middle of back. Femoral pores about thirteen.

Above ashy brown. Back with ten dorsal (and sometimes an obscure lateral) series of nearly equidistant angulated blotches, seven to ten from head to above anus, and continued above the tail, the lower surface of which is plain. Sides and sometimes fore part of back rather thickly crowded with whitish spots. No indications of light lines on sides of neck and back. Beneath whitish; the sides of the belly with a light blue patch, in which are situated ten transversely elongated indigo-black blotches, which do not extend into the dark part of the sides and are entirely visible from below. The middle line of the sides falls between the ten blotches. Faint traces of a third more posterior are occasionally visible. Female with the indigo blotches and blue patches less prominent.

This subspecies is most similar to *H. m. maculata*, but is considerably larger and has the head wider, still more convex. The scales are rather larger. The feet are of about the same proportional length. The spots on the back are quite distinct, with a light areola. Behind they are irregularly U- or W-shaped. There is a decided indication in most speci-

mens of a second lateral series on each side. There is no indication of the ten lateral light stripes on the side, nor of the pale stripe along the back separating the dorsal blotches. The sides and back are more regularly spotted with whitish. The jaws are banded transversely with bluish, which passes obliquely backward on the chin.

The most striking differences from its allies seen is the much more backward position of the two indigo-blue blotches and their inferior situation on the sides and in the whitish of the belly, and not on the sides of the body, partly in the brownish. They are also completely enveloped in the blue patch instead of having only an occasional slight suffusion of the same. They are almost entirely, instead of very slightly, visible from below.

HOLBROOKIA MACULATA FLAVILENTA Cope.

Holbrookia maculata flavilentia COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 10.—
STEJNEGER, N. Am. Fauna, No. 3, 1890, p. 109.

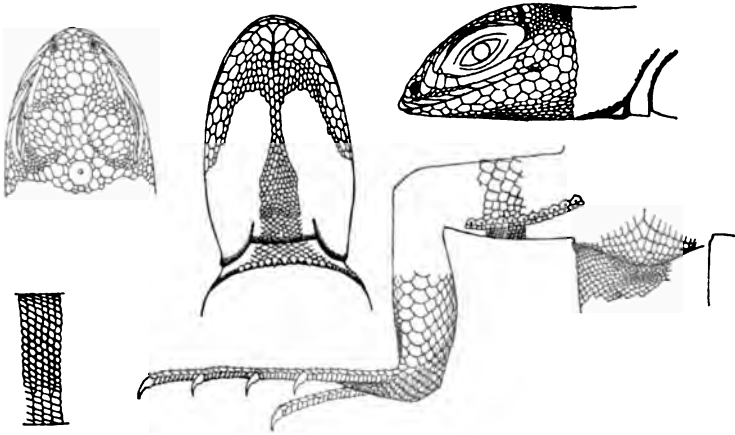


Fig. 34.

HOLBROOKIA MACULATA FLAVILENTA COPE.

× $\frac{1}{2}$.

Lake Valley, New Mexico.

Collection of E. D. Cope.

This subspecies differs from the typical form in having larger prenasal scales separated by only two flat scales in front, instead of four tubercular ones, and in having only four flat scales between the nostrils above, instead of six tubercular ones, and in having the scales of the front flatter. The spots are obscure or entirely wanting; when present they are more numerous than in the var. *maculata*, there being eight between axilla and groin, instead of six. The sides and dorsal lateral regions are thickly marked with small yellow spots.

This form was established on two specimens from Lake Valley, in southern New Mexico. Dr. Stejneger has since recorded it from southern and western Arizona.

UTA Baird and Girard.

Uta BAIRD and GIRARD, Stansbury's Exped'n, Great Salt Lake, 1852, p. 344.—

BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 210.

Urosaurus HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1854, p. 92.

Phymatolepis DUMÉRIL, Archiv. d. Museum, VIII, 1856, p. 548.

Petrosaurus BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 205.

A large interparietal, and the plates on rostrum and above orbits large and rather regular. Scales on sides small, granular; those on back imbricated, angular. Digits pectinate below. Femoral pores. Tail long. Ears distinct. A well-marked gular fold of large scales. Sides of neck folded; upper labials square; plane externally, not imbricate. A long infraorbital; nostrils lateral, subterminal. Tongue scarcely emarginate; lip slightly free with distinct pallets beneath. No palatines. Posterior teeth only tricuspid.

The preceding diagnosis is intended to define a well-marked group of diminutive North American Saurians, which would be taken for *Sceloporus* but for their very small dorsal scales and the sharp constriction, or fold, on the lower throat with a band of scales larger than those anterior or posterior to it. The plates on the head are nearly as regular as in *Sceloporus*. It is easily known, by the presence of external ears, from *Holbrookia*, which has a similar fold on the throat, and which has also the lateral folds of neck and body less distinct, or almost wanting.

There are three well-marked sections in this group; one with the dorsal scales very small, and only gradually larger than those on the sides, and another with four to six central series of very large carinated scales, those on either side abruptly smaller and tuberculate. The type species, *U. stansburiana*, belongs to the first; *U. ornata* to the second division. Dr. Hallowell has proposed a genus *Urosaurus* for the latter division based on a second species, *U. graciosus*. The gradation from this species, however, to the *U. stansburiana* through *U. schottii* and *ornata* is so very gentle that it is very difficult to draw the line. In all external characters there is little difference between *U. stansburiana* and *ornata*, except in the character of the dorsal scales, the proportions of tail and body and other features being almost precisely the same. *U. ornata* and *graciosa*, on the other hand, agree perfectly in the character of the dorsal scales, and yet differ widely in proportions and shape of head, body, and tail.

The species of *Uta* differ as follows:

- A. Dorsal scales small, smooth, nearly uniform in size. Caudal scales small, smooth, not spinous. Collar not denticulate. Tail depressed; no blue on belly. (Large species.)

Median dorsal scales a little larger than lateral dorsals; body stout, depressed; green, with three dorsal black crossbars..... *U. thalassina* Cope.

Similar to *U. thalassina*, but "with hind limb much shorter, snout shorter and more truncate, and four black transverse dorsal bars."

U. repens Van Denburgh.

- B. Dorsal scales small, smooth, subequal. Caudal scales larger, keeled, and spinous. Collar not denticulate. Tail slender. Some blue on belly.

Dorsal scales equal; scales of anus and legs strongly keeled; color olive, with a black line from shoulder to shoulder across back. Tail crossbarred with black *U. mearnsii* Stejneger.

- C. Scales on the back and sides all small, increasing very gradually from the sides to the dorsal line, where there is an obsolete carination. Tail slightly depressed toward base with enlarged keeled scales. No blue on the belly. Sides with a round black spot behind the fore leg. Back with ten series of blotches, and two light stripes on each side. Upper lateral fold of skin obsolete behind the arm, the scales on the crests of the folds scarcely larger. Tail, $1\frac{1}{2}$ times the body.

Dorsal blotches encircled by blue dots which are sometimes scattered irregularly. Sides dusky between the indistinct greenish white lines; below this sometimes with vertical light bands.

..... *U. stansburiana* Baird and Girard.

"Larger, fore legs longer; scales on edge of collar much smaller; bluish drab above with numerous small whitish dots, two or three scales large, scattered over the body; no dusky markings; blue blotch behind axilla" *U. palmerii* Stejneger.

- D. Middle of back, with 4 to 6 rows of very large rhomboidal, carinated scales, commencing some distance from the head and running to the tail. The remaining scales on either abruptly much smaller and almost granular. Tail compressed from the base. Two very distinct lateral folds of skin along the neck and body. Tail lengthened, compressed. Coloration, ashy brown. Sides with transverse, dusky bands, separated along the back, and a more conspicuous one on either side the neck. Entire sides of belly in male pale blue, dotted with whitish.

- a. Dorsal scales in five or six irregular series, four larger, the scales intermixing and varying in size, although the central ones are smaller than the external, but the outer smaller than that internal to it.

Head short, depressed, broad, nearly twice as wide as deep; enlarged scales on sides; hind legs shorter than from vent to collar; a lateral series of enlarged scales *U. ornata* Baird and Girard.

No lateral series of enlarged scales; tail less than twice length of head and body; olivaceous and without spots above *U. leriis* Stejneger.

- aa. Dorsal scales in four regular series, two on either side of the median smaller ones; continued regularly. Enlarged lateral scales in a series.

Head short, depressed. Head one and a half times as wide as deep. Hind leg equal or longer than from vent to collar. General color, light brown; the belly quite white. Tail, $1\frac{1}{2}$ times the head and body.

..... *U. symmetrica* Baird.

Head pointed, narrow; nearly or quite as high as wide. General color, nearly black, scarcely lighter beneath; back with small blue spots; tail banded laterally with the same *U. schottii* Baird.

- aaa. Dorsal scales with one principal larger row on each side of smaller ones on the median line. A lateral band of larger scales.

Dorsal median line with flat scales; frontal plate transversely divided; no frontoparietal plates; gray with black spots above.

..... *U. lateralis* Boulenger.

Dorsal median line with flat scales; frontal plate transversely divided; a crest of acute scales above the tympanum; above blue, with two rows of spots *U. auriculata* Cope.

- aaaa. Dorsal scales with irregular larger rows; larger scales of sides irregularly distributed.

Median dorsal scales granular; frontal undivided; frontoparietal plates present; brown above, dark spotted *U. bicarinata* Duméril.

Median dorsal scales granular; frontal plate undivided; frontoparietals present; greenish gray with black cross band above.

U. irregularis Fischer.

aaaa. Larger dorsal scales in five or six regular series of nearly equal size.

Frontal plate undivided; larger dorsal rows fewer; caudal scales much larger than ventrals, strongly keeled; dark brown with black cross-bands; tail, blackish; gular color orange.. *U. nigricauda* Cope.

Frontal plate undivided; dorsal scales smaller, graduating into granular laterals; gular color blue..... *U. parviscutata* Van Denburgh.

Body very slender; head narrow and elongated, but wider than high. An additional row of plates on the rostrum; frontal plate divided; tail, two and one-half times or more the head and body; general color light reddish gray; the bands distinct.. *U. graciosa* Hallowell.

The genus *Uta* belongs to the Nearctic Fauna, only two species (*U. bicarinata* and *U. auriculata*) extending beyond its limits. In the Nearctic Fauna it is nearly restricted to the Sonoran district. It does not occur in the Eastern nor Austroriparian, and one species only ranges from the Sonoran into the Pacific (*U. stansburiana*). One species is confined to the St. Lucas region (*U. thalassina*), and another ranges from that center to the Pacific (*U. nigricauda*). From the Sonoran two species range into the Great Basin, *U. stansburiana* and *U. graciosa*, the former of them extending far northward. One species, *U. mearnsii*, is found near the south border of California, while two others belong to different parts of the peninsula of Lower California (*U. repens* and *U. parviscutata*). The *U. auriculata* is from the Revillagigedo Islands, a region whose faunal relation is doubtful, but is probably with the Neotropical Realm.

UTA THALASSINA Cope.

Uta thalassina COPE, Proc. Acad. Nat. Sci. Phila., 1863, p. 104.

Petrosaurus thalassinus BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 205.

Form much depressed. Median dorsal scales larger, smooth, graduating into the lateral, smaller than those of the abdomen, not separated by median smaller ones. Abdominal scales nearly rectangular, in transverse series. Brachial scales a little larger, more imbricate, keeled. Occipital plate large, longer than broad, triangular, with rounded angles, separated by two plates from those bounding supra-orbital region. One series of interorbitals. Supraoculars in three series, five in the interior largest. Internasals, two series of four, each followed by two pairs. Scales of the collar but little larger than those anterior; gular scales equal. A narrow entire suborbital. Eight superior labials, bounded above by two series of similar plates. Eight oblong inferior labials. Symphyseal larger, followed by two trapezoid infralabials. A scapuloinguinal dermal fold on each side. Extended posterior extremity reaching anterior border of ear orifice. Tail broad and depressed at base, slender and slightly compressed,

less than twice the length of the head and body. Total length, 533 mm.; tail, 450 mm.; body, 135 mm.; from collar to end of muzzle, 56 mm.

Color above sea green; a narrow black cross band separates the nuchal from the dorsal region; a broader black band, which presents a convexity anteriorly, crosses the latter anterior to its middle. Between these some indistinct undulatory bands, three similar on the posterior dorsal region, followed by numerous caudal annuli, which become very broad. Beneath, bluish green, darkest on the gular region; tail and femora beneath yellow.

This is the largest species of the genus and is handsomely colored. It appears to be confined to the cape region of Lower California. It is

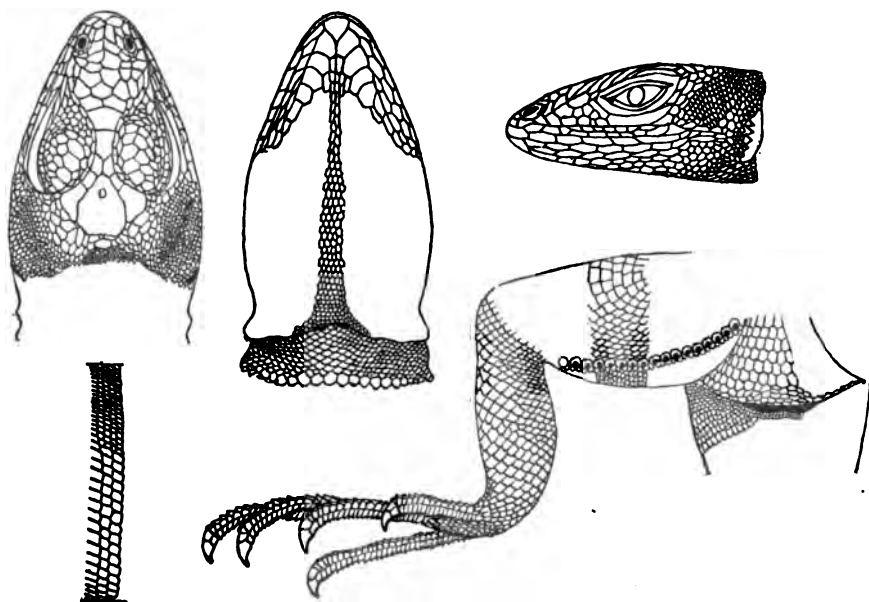


Fig. 35.

UTA THALASSINA COPE.

× $\frac{1}{2}$.

La Paz, Lower California.

Cat. No. 12635, U.S.N.M.

regarded by Boulenger as the type of a distinct genus, on account of the smaller pholidosis of the tail. The *U. mearnsii* furnishes such a complete transition to the other forms of the genus that this course does not seem to be necessary.

Uta thalassina Cope.

Catalogue No.	Number of specimens.	Locality.	Date.	From whom received.	Nature of specimen.
5302	2	Cape St. Lucas, L. California.	.....	J. Xantus	Alcoholic type.
12635	6	La Paz, L. California.	— —, 1882	L. Belding	do.
15591	1	do.....	.....	(1)	do.

UTA REPENS Van Denburgh.

Uta repens VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, p. 102, pls. VII, VIII, figs. A-E.

This species is evidently quite near to the *U. thalassina*. I only know it from the description above cited, which I quote below:

The head is broad, short, and depressed. The snout is short and truncate. The nostrils are large, superior, and much nearer to the end of the snout than to the orbit. The ear opening is large, and has an anterior denticulation of three pointed scales. The head scales are smooth and slightly convex anteriorly. The rostral is

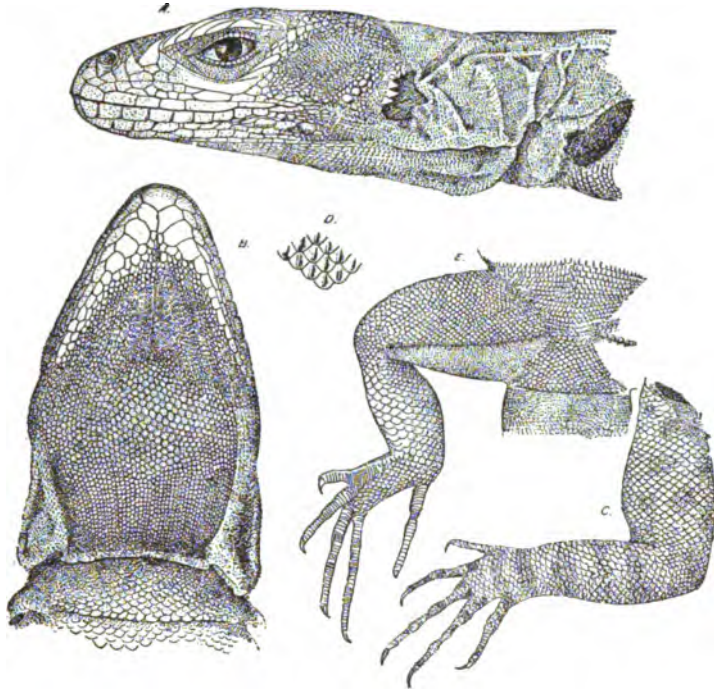


Fig. 36.

UTA REPENS VAN DENBURGH.

Fig. A, $\times 2$; other figures various sizes.

Lower California.

From Van Denburgh.

very broad and low, with a median superior projection. The frontal is transversely divided. The largest supraoculars are separated from the frontals, frontoparietals, and parietals by two series of small plates. The interparietal is very large. There are five superior and seven inferior labials to below the middle of the eye. There are several series of enlarged sublabials. The gular region is covered with small granules, which are slightly largest centrally. There is a weak anterior gular fold, followed by a strong posterior fold. The latter is covered with small subgranular plates, the largest of which, on its edge, are about equal in size to the first scales on the chest. The back and sides are covered with round granules, which are larger medially than laterally. The tail is somewhat depressed and expanded at its base, and is covered with whorls of small weakly keeled scales. The scales on the

anterior surfaces of the limbs are large and weakly keeled. The ventral plates are larger than the caudals. The color above is dull grayish olive, with four distinct anterior and three fainter posterior transverse black bands. The tail is similarly barred with dusky. The throat is brownish, marked with blackish centrally. The chest and abdomen are white, clouded with slate.

Measurements.

	<i>Uta repens.</i>		<i>Uta thalassina.</i>	
	<i>mm.</i>		<i>mm.</i>	<i>mm.</i>
Snout to vent.....	103		103	95
Snout to fold.....	34		35	33
Snout to orbit.....	7		9	8
Snout to ear.....	22		24	23
Snout to back of interparietal.....	18		20	19
Width of head.....	18		18	15
Fore limb.....	45		42	41
Hind limb.....	62		69	63
Base of fifth to end of fourth toe.....	22		27	25

This species is represented by a single specimen. Its general aspect is very much like *U. thalassina*; not at all like *U. mearnsii*.

Type.—No. 633, California Academy of Sciences; Comondu, Lower California; W. E. Bryant, April, 1889.

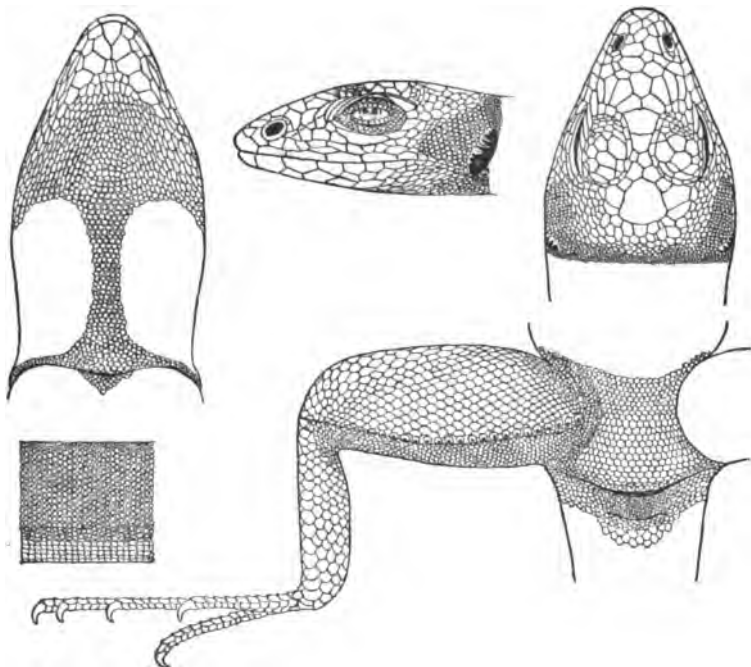


Fig. 37.

UTA MEARNSII STEJNEGER.

Southern California.

Cat. No. 21882, U. S. N. M.

UTA MEARNSII Stejneger.

Uta mearnsii STEJNEGER, Proc. U. S. Nat. Mus., XVII, 1894, pp. 589-591.

Stejneger's description of this well-marked species is so full that I quote it at length:

Description of the type.—Female. Head moderately depressed, snout narrow; canthus rostralis well marked; nostrils rather large, almost superior, much nearer to the tip of the snout than to the orbit; ear opening large, with four very long, triangular, pointed scales and three smaller ones in front; head shields smooth; frontal divided transversely; about eight of the posterior supraorbital scales enlarged, one being particularly large, these separated from the frontals by a single series of granules; superciliaries, particularly the anterior ones, very long and narrow; a very long and narrow infraorbital; occipital as large as ear opening; supralabials six, and, like rostral, very wide and low; infralabials scarcely higher, but considerably narrower; scales on throat small, rounded, smooth, those on the middle and near the edge of the gular fold somewhat larger; only one transverse gular fold, not denticulated; sides of neck strongly folded; scales on back and sides rather large, rounded and convex granules, those on lower surface of body larger, flat, hexagonal; limbs with enlarged, keeled scales, and rather long, the anterior when pressed to the side reaching to the insertion of the thigh, the posterior when stretched forward reaching to the orbit; twenty femoral pores on each side; tail depressed at base, slender, its length more than one and three-fourths that of head and body, covered with rings of rather large scales which, on the upper surface and the sides, are provided with a very strong keel ending in a projecting spine.

Color above olive, more brownish on head and tail, with irregular dusky, nearly blackish, cross bands; lighter spots, or marblings, on the interspaces; a very distinctly marked, straight, and intensely black band from shoulder to shoulder across the back; limbs irregularly cross-banded with dusky; basal two-thirds of tail pale brownish olive with wide black crossbars, terminal third uniformly blackish; under surface greenish white, bluish on flanks, with lighter dots; chin and throat with a network of bluish gray.

Dimensions.—Total length, 229 mm.; head and body, 79 mm.; tail, 150 mm.; fore limb, 37 mm.; hind limb, 61 mm.

Variation.—In addition to the type, Dr. Mearns's collection contains six other specimens, which fully establish the characters of the species. The individual variation is comparatively slight, and but few deviations from the above description of the type are noticed. In some specimens there seems to be a slight anterior gular fold, but it is not marked by any difference in the scutellation. In one specimen the frontal is not divided transversely, but in about one-half the large supraoculars are separated from the frontal by a double row of granules. Other discrepancies will be noticed in the list of specimens given below.

The males have enlarged postanal scales.

The individual differences of coloration consist mainly in the outline and intensity of the dusky crossbars, while the black collar is equally distinct in all.

The sexes are alike in color, except that the blue flank patch is somewhat darker and wider in the males.

*Comparison with *Uta thalassina*.*—Although closely allied to *Uta thalassina*, described in 1863 by Professor Cope from specimens collected at Cape St. Lucas, the present species differs in many essential points, most of which have been indicated in the diagnosis.

In addition to these it may be remarked that the granules on the back are larger in *Uta mearnsii*, but that the ventral scales are smaller; it lacks the well-defined anterior gular fold of *U. thalassina*; the legs and tail are comparatively longer, and the femoral pores are more numerous; each of the latter, moreover, is bordered behind by two granules, while in *U. thalassina* there are three. The last-mentioned species appears also to be much the larger, as the specimens collected by Dr. Mearns seem to be quite adult.

The most striking difference, however, are the long preauricular spines and the

large, strongly keeled and spinous caudal scales of *Uta mearnsi*, together with the absence of the two posterior dorsal black bands so characteristic of *U. thalassina*.

Geographical distribution.—Dr. Mearns found this species "extremely plentiful" among the rocks on the eastern slope of the Coast Range of California, near the Mexican boundary line, from the lowest water in the canyon at the base to the summit. So far this is the only locality where it is known to have been taken. I would suggest, however, that it was most probably this species which Mr. Lockington has recorded from Ensenada, Todos Santos Bay, Lower California, 75 miles southeast of San Diego¹ as *Uta thalassina*.

List of specimens.

U. S. N. M. No.	Sex.	Locality: Coast Range, California, near the Mexican boundary.	Body and head.	Tail.	Femoral pores.	Supra- labials.
			mm.	mm.		
21882	Female	Summit of range	79	150	20	6
21883	Female	Mountain Spring, eastern slope.....	74	(¹)	22	5-6
21884	Female	Eastern base	78	(¹)	20	5
21885	Female	Eastern base	75	140	21-22	5
21886	Male	Mountain Spring, eastern slope.....	70	(¹)	23-25	5-6
21887	Male	Mountain Spring, eastern slope.....	88	(¹)	21-24	6
21888	Female	Lowest water, eastern base	73	(¹)	19-20	6

¹ Tail reproduced.

In describing this species Dr. Stejneger remarks:

The accidental nature of reptile collecting is well illustrated by the discovery of this very conspicuous and distinct species in a region which has been visited before by some of our best collectors.

The trenchant character of the distinctions between the present species and its nearest ally inhabiting the Cape St. Lucas region emphasizes the gap between the Cape region proper and the rest of the Lower California peninsula.

This discovery, moreover, is quite important, inasmuch as it bridges over the supposed difference between *Uta thalassina* and the other species of the genus *Uta*. Boulenger, in 1885, established the genus *Petrosaurus* for that species because of its small caudal scales, the smoothness of the dorsal granules, and the absence of denticulation on the border of the posterior gular fold. The present species, however, has the caudal scales large, keeled, and spinose, in fact, exactly as in the typical species of the genus *Uta*; the dorsal scales are larger, more convex, nearly tubercular on the sides, thus approaching the other *Utas*, while the question of denticulation to the collar is one essentially of degree only. However, the species which I am dedicating to its discoverer, Dr. E. A. Mearns, U. S. A., naturalist of the International Boundary Commission (United States and Mexico), is undoubtedly nearly related to *U. thalassina* and more so than to any of the other species of the genus.

UTA STANSBURIANA Baird and Girard.

Uta stansburiana BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, April, 1852, p. 69, Salt Lake Valley; Stansbury, Exp. Gr. Salt Lake, 1852, p. 345; Reptiles, pl. v, figs. 4-6.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 211.—VAN DENBURGH, Proc. Cal. Acad. Sci., V, 1895, p. 104.

Uta elegans YARROW, Proc. U. S. Nat. Mus., V, 1882, p. 442; Bull. U. S. Nat. Mus., No. 24, 1883, p. 55.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, 2d ed., p. 211.

Uta schottii YARROW, Bull. U. S. Nat. Mus., No. 24, 1883, p. 55, in part.

Scales on the back very small and only obsoletely carinated, diminishing very regularly in size to the sides, without any conspicuously large scales anywhere. Head short, broad, depressed. Tail one and one-half times, hind feet one-third, the head and body.

¹ American Naturalist, 1880, p. 295.

Above dark green, with two dorsal series of crescentic dusky blotches, bordered by light blue dots, the blotches sometimes obscure and the blue dots irregularly scattered and mixed with black ones. Two light stripes on each side the neck and body, sometimes broken up into rounded spots, the lower especially where they are often elongated, forming transverse bars. The interspace of these are light lines, sometimes plain dusky, sometimes spotted with black and light blue. Beneath, greenish white; sides of jaws and the chin banded with blue. A round black spot on the anterior third of the side, sometimes encircled by yellowish; a second spot sometimes on the side of the neck. Female with the lateral spot less distinct.

The general appearance of the typical *Uta* is that of the *Scelopori* with small scales, but easily distinguished at the first glance by a well-

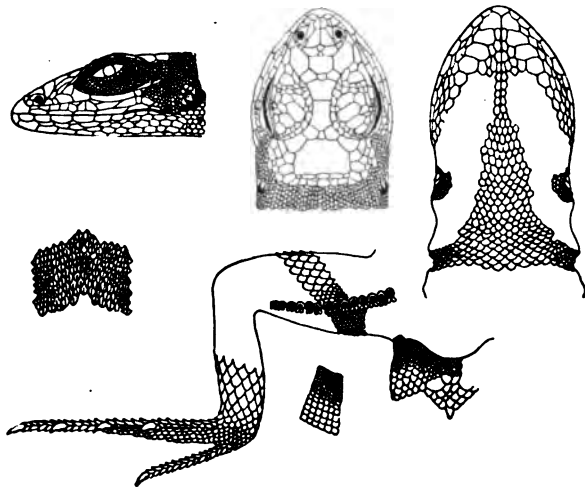


Fig. 38.

UTA STANSBURIANA BAIRD AND GIRARD.

× 2

Between Nogales and Rio Grande.

Cat. No. 9571, U.S.N.M.

marked gular fold. This is very closely pressed to the subjacent skin, the internal surface lined with very small scales. On the edge of the fold a single series of about fourteen scales considerably larger than those immediately before them or on those on the breast, about equal. There are slight indications of one or two constrictions anterior to the first, but they do not form regular folds, and there is no marked difference in the size of the scales. There is also a lateral fold or cavity on each side of the neck, lined with smaller scales, as in *Sceloporus*, but less distinct. The dorsal scales are tubercular or granular, subhexagonal, becoming gradually smaller on the sides; abruptly much smaller in the groin. They are without spines above, and barely imbricated. On the sides they are plain tubercular and almost paved. They are arranged in rather oblique series. The belly scales are flat, subrhomboidal; in

nearly transverse but slightly oblique series, and considerably larger than those on the back. The scales on the tail are verticillate, strongly carinated except below, and abruptly much larger than those on the rump or back. The scales on the thigh are about equal except on the posterior surface, where they become abruptly smaller. They diminish very gradually below from the anterior edge to the femoral pores. All the scales on the legs are strongly carinate, except on the inferior surfaces. There are fifteen femoral pores.

The plates of the head are quite regularly arranged and large, somewhat as in *Sceloporus*. There is a large occipital encircled laterally and behind by one or two series of plates which are larger than those on the nape. It is separated antero-laterally from the supraorbital region by two plates on each side, the anterior in contact or separated by a very small median one. These are in contact with a single interorbital vertical, followed by another.

The arrangement beginning with the verticils is 1, 1, 3, 3, 3, 2, and 4 internasals. The third set of 3 sometimes has the median divided transversely, and there is usually an additional very small exterior plate. The nostrils are superior, large, and rounded; in one plate with narrow margin and surrounded, except externally, by small ones. All these plates are somewhat depressed, pyramidal, or raised in the middle, sometimes conspicuously so, but they are not wrinkled. The supraorbital region shows an inner series of small plates, then a series of large transverse smooth plates with a smaller one in its concavity; exterior to these are two series of very small plates and the anterior extremity of the supraorbits is filled with a confused mixture of the same. The loreal region is filled with three or four large angular plates; the upper labials are five or six, long and narrow, not conspicuously imbricated, and rounded externally; they are bordered above by one series of plates, above which is a second shorter one. The lower labials are very similar to the upper, and bordered internally behind by three rows of plates much larger than those on the chin, the innermost alone running forward to the mental plate, and much larger than the rest. The remaining plates on the chin are rounded and larger than those on the back. The cheeks are covered with tubercles as large as the dorsal scales; there are six or seven much larger behind, where they are separated by a few small ones from the ear. This is small, rounded, and partly covered by a series of two or three long-pointed triangular scales on the anterior border. The limbs are short and stout; the hind foot about one-third the head and body, the claws very short and blunt. The tail is rather longer than the body, tapering gently throughout; depressed to near the end, which is cylindrical and much attenuated.

The general color above and on the sides is a dark, greenish-olive, varied with small blue spots on single scales, and with larger black dots interspersed more sparsely. There is in reality a serial arrangement of two rows of U-shaped dark blotches on the back, punctate

laterally and behind with blue. A faint light greenish line from the eye and another from the angle of the mouth embrace between them on the sides a dark stripe, quite continuous in some specimens and darker than the ground color; they are sometimes very distinct on the tail. The under parts are greenish-white; sometimes strongly greenish, varied with paler, and with a brassy luster. The jaws are banded transversely with blue and yellowish, extending obliquely backward on each side of the chin. In the male is a distinct rounded black spot, encircled by a yellowish border, situated in the olive of either side and in the posterior portion of the anterior third of the space between fore and hind legs. This is less distinct in the female. The legs are banded above. The under surface of tail is without markings.

In some specimens there is a tendency to a second large black spot on each side of the neck.

In nearly all the more Western specimens of this species, as in Cat. No. 4122 from the Colorado River, there are certain differences from the types Cat. No. 2753. Thus the dorsal scales become gradually larger from the head along the rump to the tail, instead of having the rump scales like those of the back, and both abruptly smaller than those on the tail. Along the middle of the back the scales are all carinated, showing about 20 longitudinal ridges. Over this space the scales become gradually smaller from the central line, then on the sides they change quite abruptly to smaller, more tubercular, and ecarinate ones, smaller in the groin and above the arm. There are twelve or fourteen ridges on the rump between the hind legs, instead of sixteen or twenty in *U. stansburiana*. The scales on the lower part of back and rump are quite as large and even larger than those on the belly, not smaller.

The colors are quite similar; the upper part dark green, spotted with lighter. Few dorsal series of blotches. The under parts are blue in very old specimens; the chin darker; the lateral black spot very conspicuous.

The sides are frequently quite uniformly dark green, with a series of light vertical bars behind the lateral black spot. In Cat. No. 2753 there are two black bars across the nape. In this variety there is an evident approach to the peculiar characters of *Uta ornata*.

This species is abundant in the entire region between the Rocky Mountains and the Sierra Nevada. I have taken it as far north as Summer Lake in central Oregon, north of which I have no record of its existence. It inhabits rocky places, especially the basaltic cliffs so common in the Great Basin, and delights in the hot sun. It is very active in its movements.

Dr. Merriam, in his report on the results of the Death Valley Expedition, makes the following remarks concerning the distribution of this species:

This tiny brown-shouldered lizard is common over nearly the whole of the desert region traversed by the expedition from California to Utah and Arizona, and occurs also on the west slope of the Sierra Nevada, as the subjoined list of localities shows.

Whether the form inhabiting the upper San Joaquin Valley is identical with that from the deserts remains to be seen.

Uta stansburiana is common throughout the Mohave Desert, ranging westward to the extreme west end of Antelope Valley and down through the Cañada de las Uvas to old Fort Tejon. It ranges also over Walker Pass and down into Kern Valley. It is common in Owens Valley and thence easterly in the Coso Mountains, Panamint Valley and Mountains, Death Valley, the Amargosa Desert, Ash Meadows, Pahrump and Vegas valleys, and at the Great Bend of the Colorado, whence it ranges north-erly in the valleys of the Virgin and Muddy to the Santa Clara Valley in south-western Utah, and the Pahranaagat Valley, Nevada. In western Nevada it was not found north of Sarcobatus Flat.

Uta stansburiana Baird and Girard.

Catalogue No.	Number of speci- mens.	Locality.	Date.	From whom received.	Nature of specimen.
2753	6	Salt Lake City, Utah		Capt. H. Stansbury, U. S. A.	Alcoholic type.
4957	1	Pecos River, Texas		Capt. John Pope, U. S. A.	Alcoholic.
4857	2	do		J. K. Townsend	do.
4855	3	do		do	do.
8529	1	San Ildefonso, New Mexico	Aug. —, 1874	Cope and Yarrow	do.
2800	1	Albuquerque, New Mexico		Lieut. A. W. Whipple, U. S. A.	do.
8530	1	Cave Spring, Arizona	July —, 1874	H. W. Henshaw	do.
8480	1	Camp Crittenden, Arizona	Aug. —, 1874	J. H. Rutter	do.
8172	5	Arizona	— —, 1871	F. Bischoff	do.
8146	2	Southern Utah		do	do.
8149	2	Dome Canyon, Nevada	— —, 1872	Dr. H. C. Yarrow	do.
9377	2	do		do	do.
8616	10	Santa Barbara, California	June —, 1875	H. W. Henshaw	do.
8642	5	Olamchu Peak, California	Sept. —, 1875	do	do.
8619	2	Santa Cruz Island, Cali- fornia	June —, 1875	Dr. O. Loew	do.
9517	2	Fort Tejon, California	Aug. —, 1875	J. Brown	do.
8614	1	Southern California	— —, 1875	H. W. Henshaw	do.
8639	1	Mohave Desert, Arizona	— —, 1875	J. A. Hasson	do.
8618	2	Fillmore, Utah	Sept. —, 1872	Dr. H. C. Yarrow	do.
8621	3	Mohave Desert, Arizona	— —, 1875	Dr. O. Loew	do.
4122	3	Colorado River		Lieut. J. C. Ives, U. S. A.	do.
8569	1	Cerro Island, Lower Cali- fornia		Dr. T. H. Streets, U. S. N.	do.
8570	1	Lower California		do	do.
9484	1	Ralston, Arizona		Dr. C. G. Newberry	do.
9489	3	Cottonwood Canyon, Utah		do	do.
8615	1	Virginia City, Nevada	— —, 1876	Expl. W. of 100th M.	do.
5306	12	Cape St. Lucas, L. Cali- fornia		J. Xantus	do.
12671-72	7	La Paz, L. California	— —, 1882	L. Belding	do.
11973	1	do	— —, 1882	do	do.
11976	4	do	— —, 1882	do	do.
11982	1	do	— —, 1882	do	do.
9571	4	Between Nogales and Rio Grande		Dr. C. B. R. Kennerly	do.
15877		Carmen Island, Gulf of California	Mar. 8, 1889	U. S. Fish Commission	do.
15881		San Luis Gonzales Bay, Gulf of California	Mar. 27, 1889	do	do.
15894		San Bartolome Bay, Lower California	Apr. 11, 1889	do	do.
15909-17		Santa Cruz Island, Cali- fornia	Feb. 7, 1889	do	do.
15938-39		San Clemente Island, Cal- ifornia	Jan. 28, 1889	do	do.
15963-64		Yuma, Arizona	— —, 1889	do	do.
16518		Colorado Desert, California	— —, 1890	C. R. Orentt	do.
13892		San Diego, California	June 16, 1884	do	do.
14131		Lower California	May 14, 1885	do	do.
16507-9		Colorado Desert, Califor- nia	Apr. —, 1890	do	do.
17216-17		Tucson, Arizona		P. L. Jouy	do.
16817-25		do		do	do.
15584		La Paz, Lower California		L. Belding	do.
15877		Carmen Island, Gulf of California		U. S. Fish Commission	do.
15881		San Luis Gonzales Bay, Gulf of California		do	do.
16667-73		Tucson, Arizona		P. L. Jouy	do.
16896		do		do	do.
16926		do		do	do.

Uta stansburiana Baird and Girard—Continued.

Catalogue No.	Number of specimens.	Locality.	Date.	From whom received.	Nature of specimen.
17152-54		Tucson, Arizona	.....	Herbert Brown	Alcohol.
17402		Alhambra, California	.....	C. W. Richmond	do.
17412		Pasadena, California	.....	do.	do.
17645		Tempe, Arizona	.....	Edgar L. Storment	do.
17913		Frisco, California	.....	Gustave Eisen	do.
19361-70		Mexican boundary line	.....	Dr. E. A. Mearns	do.
19477		do	.....	do.	do.
20212-13		Witch Creek, Santa Ysabel, San Diego County, California.	.....	H. W. Henshaw	do.
20342-44		do	.....	do.	do.
20400		do	.....	do.	do.
21524-27		San Fernando, Lower California.	.....	A. W. Anthony	do.
21543-52		San Clemente Island, California.	.....	do.	do.
21556-57		Santa Catalina Island, California.	.....	W. S. Tangler Smith	do.
21729		Gila City, Yuma County, Arizona.	.....	Dr. E. A. Mearns	do.
21731		Adonde Siding, Arizona	.....	do.	do.
21732		Yuma, Arizona	.....	do.	do.
21733		Tineja Alta, Yuma County, Arizona.	.....	do.	do.
21734		Gila River near Adonde, Yuma County, Arizona.	.....	do.	do.
21735-36		Sonoita, Arizona	.....	do.	do.
21737-39		Poco de Luis, Sonora, Mexico.	.....	do.	do.
21740		Warsaw Mill, M. B. L., Arizona.	.....	do.	do.
21741-46		Sonoita, Sonora, Mexico	.....	do.	do.
21747-48		Warsaw Mill, M. B. L., Arizona.	.....	do.	do.
21749-65		Fort Lowell, Arizona	.....	do.	do.
21878-81		San Clemente Island, California.	.....	do.	do.
21889-93		Mountain Spring, east edge Coast Range, California.	.....	do.	do.
21894		Jacumba Hot Spring, mon. 233, California.	.....	do.	do.
21895		Mountain Spring, San Diego County, California.	.....	do.	do.
22266		Las Cruces, New Mexico.	.....	Dr. T. D. A. Cockerell	do.
22582-84		Strawberry Valley, Riverside County, California.	.....	C. R. Orcutt	do.
22585-86		San Diego County, California.	.....	do.	do.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	Date.	Collector.
18508	Male	St. George, Utah	Feet.	May 13	Bailey.
18509	Male	do	3,000	do	do.
18510	Male	do	do	do	Merriam.
18511	Female	do	do	May 14	do.
18512	Female	do	do	do	do.
18513	Female	do	do	May 13	do.
18514	Female	do	do	do	Bailey.
18515	Female	do	do	do	do.
18516	Female	do	do	do	do.
18517	Male	Virgin River, Nevada	do	May 6	do.
18518	Male	Charleston Mountains, Mountain Spring, Nevada.	5,600	Apr. 30	Merriam.
18519	Female	do	5,600	do	do.
18520	Male	Pahrump Valley, Nevada	do	Feb. 19	Nelson.
18521	Male	do	do	Feb. 26	Palmer.
18522	Male	do	do	Apr. 28	Merriam.
18523	Female	do	do	Apr. 29	Bailey.
18524	Male	Pahrangat Valley, Nevada	do	May 23	Merriam.
18525	Male	Vegas Valley, Nevada	1,800	Mar. 12	Bailey.
18526	Female	do	1,800	do	do.
18527	Male	Ash Meadows, Nevada	do	Mar. 2	Nelson.
18528	do	do	do	Mar. 4	do.
18529	Female	do	do	Mar. 17	do.

Uta stansburiana Baird and Girard—Continued.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	Date.	Collector.
			<i>Feet.</i>		
18530	Male...	Ash Meadows, Nevada		Mar. 13	Fisher.
18531	Male ¹ ...	do		Mar. 14	do.
18532	Female...	do		Mar. 10	do.
18533	Female...	do		Mar. 11	do.
18534	Female...	do		Mar. 13	do.
18535	Female...	do		Mar. 2	Stephens.
18536	Female ² ...	do		do.	do.
18537	Male...	Death Valley, California		Jan. 23	Bailey.
18538	Female...	do		do.	do.
18539	Male...	do		Mar. 22	Nelson.
18540	Male...	do		do.	do.
18541	Female...	Death Valley, near Salt Wells, California		Jan. 20	Bailey.
18542	Male...	Death Valley, Bennett Wells, California		Jan. 21	Palmer.
18543	Male...	do		do.	do.
18544	Male...	do		do.	Fisher.
18545	Male...	do		do.	do.
18546	Male...	do		do.	do.
18547	Male...	do		Jan. 22	Nelson.
18548	Male...	do		Jan. 24	do.
18549	Male...	do		Jan. 26	do.
18550	Male...	do		do.	do.
18551	Female...	do		do.	do.
18552	Female...	do		Jan. 28	Bailey.
18553	Female...	do		Apr. 28	do.
18554	Male...	Death Valley, Mesquite Well, California		Jan. 20	Fisher.
18555	Female...	do		do.	do.
18556	Male...	Death Valley, Furnace Creek, California		Feb. 1	Palmer.
18557	Male...	do		Jan. 26	do.
18558	Male...	do		Jan. 24	do.
18559	Male...	do		Jan. 23	Fisher.
18560	Male...	do		Jan. 30	do.
18561	Female...	do		Apr. 10	Stephens.
18562	Female...	Funeral Mountains, California		Feb. 6	Nelson.
18563	Female...	do		do.	do.
18564	Male...	Death Valley, Saratoga Springs, California		Feb. 3	Bailey.
18565	Male...	do		Jan. 30	do.
18566	Male...	do		do.	do.
18567	Female...	do		do.	do.
18568	Female...	do		Feb. 2	Nelson.
18569	Male...	do		do.	do.
18570	Female...	Resting Springs, California		Feb. 13	Fisher.
18571	Adult...	Borax Flat, Water Station, California	2, 100	Apr. 22	Stephens.
18572	Male...	Panamint Mountains, Johnson Canyon, California		Mar. 30	Fisher.
18573	Male...	do		do.	do.
18574	Female...	do	5, 000	Mar. 28	do.
18575	Female...	do	5, 560	Apr. 3	Nelson.
18576	Male...	do	6, 000	Mar. 31	do.
18577	Male...	Panamint Valley, California		Jan. 5	Bailey.
18578	Male...	do	1, 575	Jan. 12	do.
18579	Male...	do	1, 575	do.	do.
18580	Female...	do		Jan. 5	do.
18581	Female...	do		Apr. 20	do.
18582	Male...	Coso Mountains, Coso, California		May 22	Fisher.
18583	Female...	Panamint Mountains, Emigrant Spring, California		Apr. 14	Bailey.
18584	Male...	Mohave Desert, Leach Point Spring, California		Apr. 25	do.
18585	Female...	Keeler, California		June 3	Fisher.
18586	Male...	Fort Tejon, California		June 28	Merriam.
18587	Male...	do		do.	do.
18588	Female...	Antelope Valley, Liebré Ranch, California		do.	do.
18589	Male...	Walker Pass (west slope), California	4, 600	July 3	Bailey.
18590	Male...	Roses Station, California		Oct. 13	Nelson.
18591	Male...	Kernville, California		June 23	Palmer.
18592	Male...	do		do.	do.
18593	Male...	Kern River, South Fork, California	2, 700	July 9	Bailey.
18594	Male...	Fresno, California		Sep. 23	do.
18595	Male...	do		do.	do.
18596	Male...	Lone Pine, California, (Lone Pine Canyon)	7, 000	Dec. 19	do.
18597	Male...	Caliente, California		June 24	Palmer.

¹Immature.²Young.

UTA PALMERII Stejneger.

Uta palmerii STEJNEGER, North American Fauna, No. 3, 1890, p. 104.

Similar to typical *U. stansburiana* and with the same dorsal lepidosis, the scales being small, tuberculate, and not carinated for their entire length, but much larger and with longer fore legs, the tips of which when adpressed reach to or beyond the insertion of the thigh; scales on edge of collar much smaller; large prefrontals, about twice as large as the largest supraoculars; number of femoral pores about 17; about thirty dorsals in a head length; color (in alcohol) above, uniform bluish drab, with numerous small whitish dots, two to three scales large, sprinkled over the body, and no dusky markings whatever; dark-blue blotch behind axilla present, though rather indistinct.

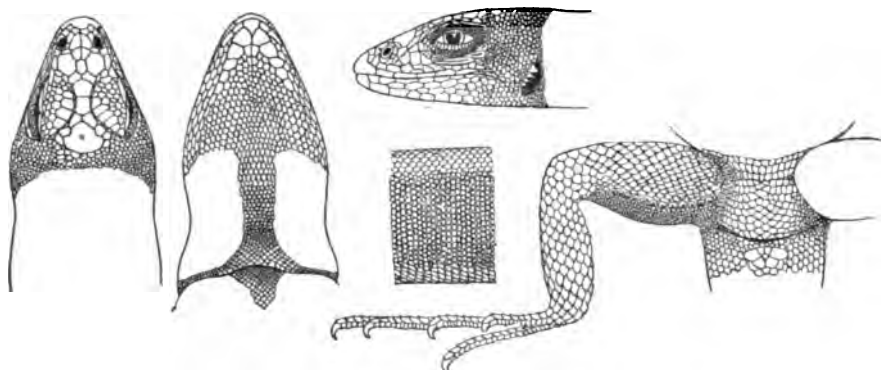


Fig. 39.

UTA PALMERII STEJNEGER.

× $\frac{1}{2}$.

San Pedro Martir Island, Gulf of California.

Cat. No. 16003, U.S.N.M.

Habitat.—San Pedro Martir Island, Gulf of California.

Type.—No. 16002, U. S. N. M., Edward Palmer, collector.

Dimensions of largest specimen (female).—Total length (tail reproduced), 158 mm.; head, 15 mm.; width of head, 14 mm.; snout to posterior gular fold, 25 mm.; gular fold to vent, 48 mm.; fore limb, 33 mm.; hind limb, 52 mm. Stejneger.

UTA LEVIS Stejneger.

Uta levis STEJNEGER, North American Fauna, No. 3, 1890, p. 108.

A band of about six longitudinal, somewhat irregular rows of enlarged and only slightly carinated scales along the middle of the back from the shoulders backwards; the two median rows smaller; no lateral line of enlarged scales or tubercles on body or neck; frontal divided transversely; tail much less than twice the length of head and body; length of hind leg considerably less than distance from posterior gular fold to vent; no dark spot behind axilla.

This form, of which both male and female (Cat. Nos. 11474, 8554) were collected by myself at Tierra Amarilla, about 110 miles northwest of Santa Fé, New Mexico, at an altitude of about 7,800 feet, is easily distin-

guished from *U. ornata*, its nearest ally, by the absence of the lateral enlarged scales, or tubercles, those on the dorso-lateral fold being scarcely perceptibly larger than the other dorsal granules; nor are there any pointed tubercles or clusters of tubercles on the neck. In addition to these characters the carination of the enlarged dorsals is rather feeble. As in typical *U. ornata*, the hind legs are short and the

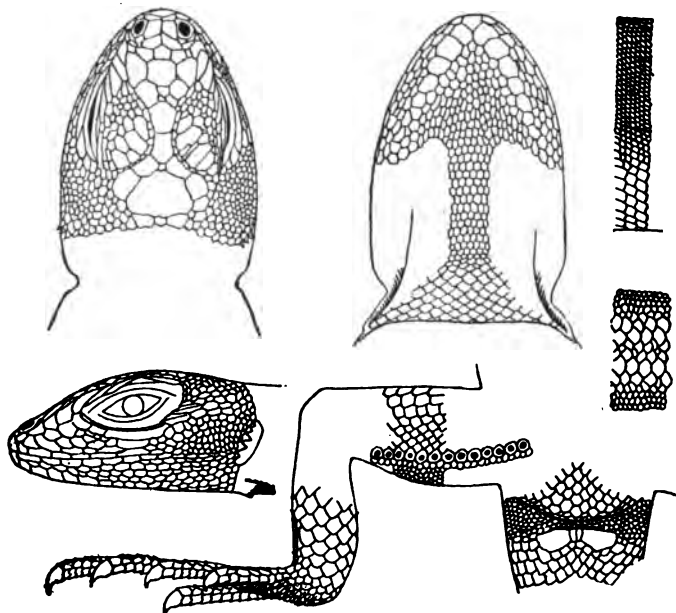


Fig. 40.

UTA LEVIS STEJNEGER.

× 2.5.

Tierra Amarilla, New Mexico.

Cat. No. 11474, U.S.N.M.

dorsal scale rows very irregular. The color of both specimens above is uniform pale without the slightest trace of markings; the male has flank patches of a pale sky-blue (in alcohol).

Uta levis Stejneger.

Catalogue No.	Number of specimens.	Sex.	Locality.	From whom received.	Nature of specimen.
8554	1	Male.	Tierra Amarilla, New Mexico	E. D. Cope..	Alcoholic.
11474	1	Female	do	do	do.

UTA ORNATA Baird and Girard.

Uta ornata BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, 1852, p. 126 (Sonora and Texas); U. S. Mex. Bound. Surv. Rept., 1859, p. 7.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 213.

Head short and broad, depressed. The large dorsal scales five or six in number, all quite irregular in direction and shape, the external smaller than the next, the median smallest. Tail about one and one-half times the head and body. Above dark gray, with broad transverse bars of black on each side, bifurcating or expanding above; a more conspicuous band on each side the neck; beneath grayish, the male with two elongated patches of light blue on each side the belly. Spotted with whitish.

Variety *linearis*.—Four broken longitudinal black stripes.

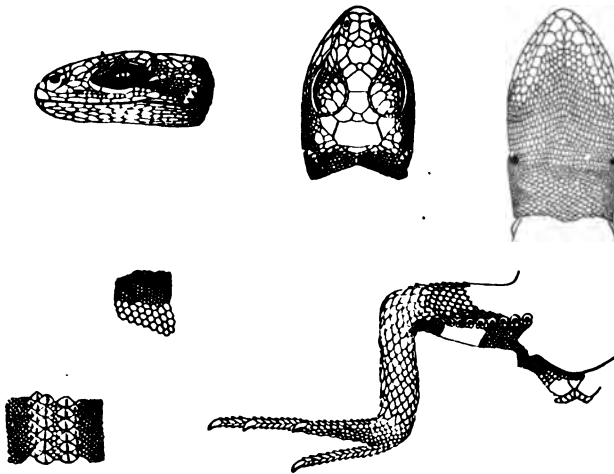


Fig. 41.

UTA ORNATA BAIRD AND GIRARD

× 2.

San Pedro.

Cat. No. 2150, U.S.N.M.

This species has much the same form and general characters of *U. stansburiana*, the principal difference being in the character of the dorsal scale. These in the type are all very minute, but carinated, diminishing gently toward the sides. In *U. ornata* there is a dorsal series of three or four very large carinated scales, beginning near the head and running to the tail for an average width of half the head. These are not very regular, varying much in size at different points, sometimes with small ones intercalated. On either side of this the scales are abruptly very small and granular, becoming smaller to the lower part of the sides, where they are much as in *stansburiana*. The folds of skin on the neck and back generally have a series of larger scales

along their summit, especially on the dorsal folds, distant about the width of the head, where the larger scales occur at intervals. The scales on the tibial joint are larger and more angulated than in the other. The hind feet are short, not one-third the head and body; the hind feet are shorter, the fingers considerably longer than in *stansburiana*. The head is broad; the width equal to the distance from snout to middle of occipital, the free portion of long hind toe a little less.

The tail is a little longer than the body, or possibly longer, as it has been renewed; depressed or trigonal at base, then cylindrical or even a little compressed. The femoral pores are about eleven in number.

The scales on the chin are quite small and rounded or paved, decidedly smaller than the imbricated rhomboidal scales of the space between the gular folds.

The folds of skin, where they can be made out, appear to run in the following manner: The longest starts in a line with the edge of the head above and a short distance behind the head, running back to the upper edge of the insertion of the thigh. This is crowned at intervals by large scales. The second begins on the lower part of the sides, just back of the axilla, and after rising a little runs back nearly to the groin parallel with the upper fold. This likewise shows occasional larger scales. The fold crossing the throat and shoulders anteriorly is continued a little obliquely backward to the upper or dorsal fold. Anterior to this, another fold begins on either side the throat and extends half way round the side of the neck, where it covers the gular cavity seen here and in *Sceloporus*. Here it meets a short fold running downwards from the upper border of the ear (continued behind to the first transverse fold), and from this point of intersection there proceed two folds across to the upper or dorsal one, united below. A second short fold runs from the lower edge of the ear back to the second transverse fold.

This species is of a brownish gray above; each side of the back with a series of transverse narrow bars of black, with a light grayish areola and varying in shape, sometimes a meniscus, sometimes bifurcating. There are usually two short longitudinal stripes on the nape. From the shoulder usually runs a dark line perpendicularly to the back, and sending a short branch abruptly forward at a right angle and in line with the ventral stripes. The under parts are white, in the male the chin is greenish, and on each side the belly, nearly meeting centrally, is an elongated patch of light greenish or bluish as in *Sceloporus*.

Variety *linearis*.—Among the specimens before me are several (as Cat. No. 2759), which, with the general characters of *Uta ornata*, have instead of the transverse bands a trace of four dorsal black lines, interrupted at irregular intervals, and thus broken up into sections from an eighth of an inch to an inch. One of these on either side borders the large scales, the other runs along the raised lateral fold. There is the usual blackish bar in front of the shoulder forming a kind of interrupted collar. There are a few light spots on the side.

Uta ornata Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2750	2	San Pedro .....	.....	Col. J. D. Graham, U. S. A.	Alcoholic type.
8156	1	Arizona	— —, 1871	F. Bischoff	Alcoholic.
8476	3	San Carlos, Arizona	Oct. 7, 1874	H. W. Henshaw	do.
8527	1	do	Oct. 17, 1874	J. H. Rutter	do.
8528	1	Gila River, Arizona	Oct. —, 1874	Dr. O. Loew	do.
8557	2	Southern Arizona	Oct. —, 1873	H. W. Henshaw	do.
9376	3	Fort Yuma, California .....	.....	.....	do.
8181	1	Utah	— —, 1872	Expl. W. of 100th M.	do.
8556	1	Col. Chiquita, New Mexico.	July 21, 1873	H. W. Henshaw	do.
2763	2	Colorado River, Colorado .....	.....	Lieut. J. C. Ives, U. S. A.	do.
5030	3	Arizona? .....	.....	Dr. B. J. D. Irwin, U. S. A.	do.
8641	1	Nevada	— —, 1873	Dr. H. C. Yarrow	do.
8667	1	Virgin River to Fort Mohave, Arizona.	Aug. —, 1875	William Somers	do.
8668	1	Southern California	— —, 1875	J. A. Hasson	do.
8665	2	do	— —, 1875	do	do.
8666	4	Mohave Desert, Arizona.	July —, 1875	Dr. O. Loew	do.
9479	1	Ralston, Arizona	— —, 1874	Dr. C. G. Newberry	do.
12665	7	La Paz, L. California	— —, 1882	L. Belding	do.
4275	2	San Francisco Mountain, Arizona.	.....	Lieut. Ives	do.
15841	1	do .....	.....	Dr. C. H. Merriam	do.
14786	1	Plateau Creek, Colorado .....	.....	T. D. A. Cockerell	do.
15693	1	Prescott, Arizona .....	.....	Capt. W. L. Carpenter	do.

A single specimen obtained in middle Utah in 1872. In 1873 and 1874 the species was found to be quite numerous in Colorado, Arizona, and New Mexico, frequenting rocky places and exceedingly hard to catch. Color of throat, yellowish orange; of abdomen, white, ranging to greenish olive. The general coloration depends much upon the color of the rock upon which they are found.

UTA SYMMETRICA Baird.

Uta symmetrica BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 253.—COUES, Wheeler's Report Surv. W. 100th Mer., V, 1875, p. 597.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., 1885, p. 213.—STEJNEGER, North American Fauna, No. 3, 1890, p. 108.

Head broad, short, depressed. Two regular series of large dorsal scales on each side the back, with two others much smaller between them along the median line. Tail about one and a half or one and three-fourths times the length of head and body.

Above dark or light brownish gray. Sides with broad transverse bands of blackish, sometimes bifurcating above. Sides of neck with a more distinct and linear band. Sides of belly in male blue, spotted with white.

Stejneger remarks¹ that this species differs from the *U. ornata* in the greater length of its legs, as well as in scale characters. Thus he says in the *U. ornata* the hind leg is shorter than the distance between the vent and the collar, while in the *U. symmetrica* this length is equal to or greater than that dimension. In four specimens of *Utas*

¹ North American Fauna, No. 3, 1890, p. 108.

in my private collection from Sonora the dorsal scales are precisely those of the *U. symmetrica*, but the posterior legs are shorter than the distance between the vent in collar in all of them.

The difference in the regularity of the dorsal scales in specimens from Texas and Utah and California (as Cat. No. 2742) is so strongly marked that I am inclined to separate them as a decided variety, if not as a good species. The coloration is much the same.

They have the fine set scales above smaller and more regular. The dorsal plates are in four pretty regular series from near head to tail,

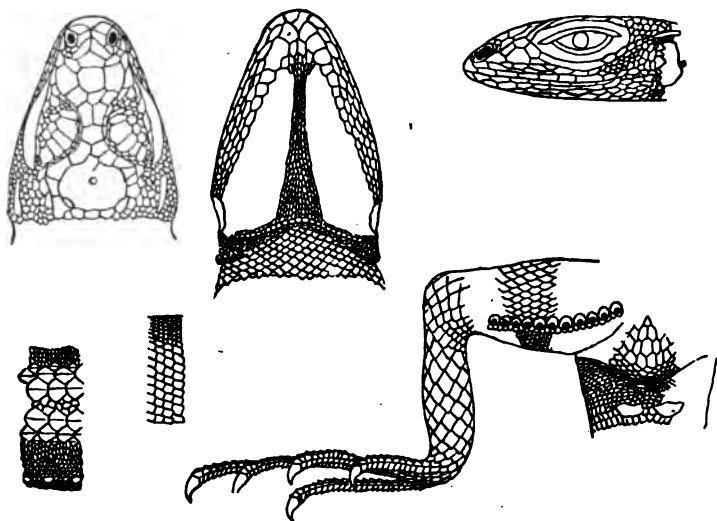


Fig. 42.

UTA SYMMETRICA BAIRD.

× 2.5.

Cat. No. 8557, U.S.N.M.

embracing along their median line two series of smaller ones, making six in all. Sometimes the median small scales are in greater number. The plates on the cheeks and chin appear more minute.

The head is very broad; the width reaching to the posterior extremity of the occipital. The tail is from one and one-half to two times the length of head and body. The coloration is very much the same; the ground tint above darker.

Cat. No. 4275 from the San Francisco Metropolitan National Museum has the scales on the back quite uniform and regular, much as in *U. gracoisa*.

Uta symmetrica Baird.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2760	1	Fort Yuma, Arizona .....	.....	Alcoholic.
2744	16	.....	.....	do.
15838-40	3	Grand Canyon of Colorado, Arizona.	V. Bailey	do.
8537	1	.....	.....	do.
14750-51		Fort Huachuca, Arizona.	Benson	do.
17786		do	Wilcox	do.
22236-40		do	Fisher	do.
15977		Reido, Mexico	U. S. Fish Commission	do.
19690-703		Fort Huachuca, Arizona	Wilcox	do.
17220-24		Nogales, Arizona	P. L. Jouy	do.
17225-26		32 miles south of Nogales, Arizona.	do	do.
17218-19		Tucson, Arizona	do	do.
16896-907		do	do	do.
16909-16		do	do	do.
16918-26		do	do	do.
16859-87		do	do	do.
16889-95		do	do	do.
16813-16		do	do	do.
15946		Fort Yuma, Arizona	U. S. Fish Commission	do.
21896-908		Fort Yuma, California	Dr. E. A. Mearns	do.

UTA SCHOTTII Baird.

Uta schottii BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 253.

Head pointed; narrow and nearly as high as wide. Dorsal scales in two regular series along either side of the median line, which is occupied by two or three rows of smaller ones. Tail probably twice the body.

General color, nearly black; brownish below. Sides with broad, dark bands; upper parts spotted thickly with light blue, especially on the back. The sides of the tail with bands of the same. Sides of belly in male blue, with white spots; chin blue.

In this species the head is elongated and pointed, compressed and narrow, nearly or quite as deep as broad. The plates on the occiput on either side of the large median one are unusually large, much more than in *U. ornata* and tubercular. In front of the two verticals (1, 1) the plates are 2, 3, 3 and 4 to the two large internasals. The nostrils are quite oblique, though within the *canthus rostralis*. There are four rows of supraorbital plates exclusive of the inner margin. The scales in the middle of the chest are much smaller than in its exterior. The lateral folds appear as in *ornata*. The solitary plates in the upper lateral fold seem unusually large. The dorsal large scales are in two very regular series on either side of the median line (making four), and inclose an interval filled with two or three rows of much smaller, though irregular carinated scales. The large scales appear much larger than in allied species. The tail is broken off, but is probably about twice the head and body.

The general pattern of coloration is much as in allied species, except that the ground color appears nearly black all over. On the back, however, the transverse darker bars may be traced, and there exhibit a tendency to unite on the back. The upper parts and sides of body

and limbs are dotted with well-defined blue spots, most abundant along the back. There are blue bands on the sides and blue spots on the back of such portion of the tail as still remains. The whole under surface of the head is blue; darkest on the point of the chin. The sides of the belly (and even the central portion) are dusky bluish, the blue deepest anteriorly; the whole under part with light bluish spots. The remaining under parts are of a dark pepper and salt mixture.

Although not much reliance can be placed on the rostral plates as furnishing characters, yet in the single specimen of the present species there are but four in the series behind the internasals, instead of the five or six on the others. The occipital plates on each side the median one are much larger than usual. The head is elongated and narrow, but nearly or quite as deep as wide, differing in its narrowness from *ornata* and in its depth from *graciosa*. The dorsal scales are unusually large; they agree with *U. symmetrica* in the distinctness of the series on each side, inclosing smaller ones between, but are considerably larger.

The colors are much darker than in others, and the light blue spots above and on sides of tail appear peculiar to it.

I have been unable to find the typical specimen of this species, and the above description is taken from Professor Baird's manuscript. No other specimens have been correctly identified with it, those given in Yarrow's check list being the *U. stansburiana*.

UTA BICARINATA Duméril.

Uta bicarinata COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 177.

Phymatolepis bicarinatus A. DUMÉRIL, Arch. Mus., VIII, 1856, p. 549, pl. xxiii, fig.

2.—BOCOURT, Miss. Sci. Mex., Rept., 1874, p. 165, pl. xvii bis, fig. 9.

Back with two series of large carinated scales, forming on each side of the vertebral line a slightly raised keel, which begins at a level with the shoulders and is prolonged on the tail. Irregular black spots, longer than broad, are scattered over the body, which form, on a ground of a greenish-yellow, a partial collar on the neck, and on the tail narrow half-rings, regularly spaced. Legs and toes crossed by spots of the same color.

Trunk slightly depressed; limbs feeble, especially the front ones. Tail rather long and robust. Head small, muzzle short, pointed, and flat; nostrils round, each opened in a plate of similar shape and slightly projecting; rostral plate triangular, a little raised, but equaling in size the space comprised between the external borders of the nostrils; two pairs of internasal scales; prefrontal region with scaly sheets, rather large and polygonal; frontal plate pentagonal, slightly wider in front than behind, in contact at the posterior edge with the two frontoparietals which border the interparietal in front; this latter is quite wide, rather broader than long, equaling in breadth one-third the length of the head; it is bordered on each side by two parietals, and posteri-

only by three very small scales; supraocular scales equal in size, particularly in the female, four in number, broader than long, and surrounded by scutella more numerous in front than on the other sides. The edge of the muzzle protected by two scales with projecting keel, followed by two overhanging scales, slightly elongated; a long narrow scutellum forms almost the entire suborbital arch; on each lip there are five or six pairs of plates; the upper ones are surmounted by another row of scales just a little smaller. Mental plate pentagonal, as wide as it is high, having an acute angle behind; and followed on each of the jaws by rather large scutella, which gradually diminish in size as they recede. Auricular opening large, with the anterior border furnished with small

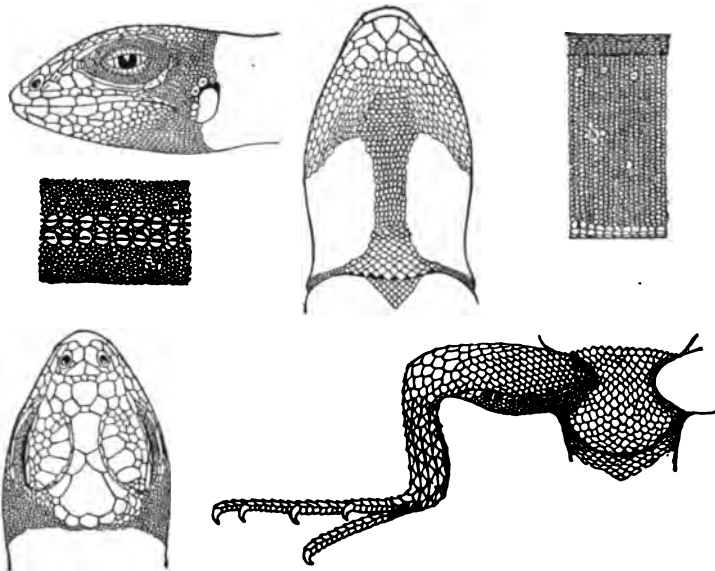


Fig. 43.

UTA BICARINATA DUMÉRIL.

× 1.5.

Chihuahua, Mexico.

Cat. No. 14248, U.S.N.M.

conical scales, forming a feebly-toothed structure. Under the neck there is a granulated pavement separated from the larger and imbricated scales of the chest by the two transverse folds of the neck; the scales of the posterior part of this region are better developed and terminate in points; on the sides of the neck there are wrinkles edged with little tubercles, forming longitudinal ridges, originating back of the ear, one of which is prolonged underneath the arm. Trunk lightly depressed, covered above and on the sides with small scales, almost round, slightly convex, not imbricated, and among which the keeled scales show like small tubercular elevations; scales of the abdomen rather large, smooth, and imbricated. Tail longer than the head and

body, whorled irregularly above and regularly below, presenting everywhere the large scales imbricated and keeled. Limbs short, the length of the tibia scarcely equaling the space comprised between the end of the muzzle and the exterior border of the occipital plate; the front of the arms and thighs and the external part of the legs furnished with keeled and imbricated scales, nearly as large as those of the tail; the granulations resemble those of the flanks protecting the back of the thighs. The feet are covered above and below with small keeled scales. Eleven or twelve pores on each thigh. Male with two large glossy scales behind the arms.

Measurements.—Total length of male, 140 mm.; length of head above, 125 mm.; length of head below, taken from chin to pectoral fold, 17 mm.; length of head at the level of the temples, 11 mm.; length from pectoral fold to arms, 38 mm.; length of tail, 83 mm.; length of tibia, 115 mm.

General color, a greenish gray, with limbs and tail shaded with reddish brown; a black stripe forming a collar passes across the neck; traces of the same color cross the head, back, and flanks; the limbs, toes, and tail equally crossed by small brown bands. Inferior regions tinted yellow lightly stippled with brown; males have the entire abdominal region a bluish gray, a mode of coloration approaching that seen in animals of the same sex belonging to the genus *Sceloporus*.

This species occurs throughout Mexico, as far north as the city of Chihuahua, where it was obtained by Mr. Edward Wilkinson.

UTA NIGRICAUDA Cope.

Uta nigricauda COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 176; 1866, p. 312.—GARMAN, Bull. Essex Inst., XVI, 1884, p. 16.—BOULENGER, Cat. Liz. Brit. Mus., 2 ed., II, 1885, p. 212.—BELDING, W. Amer. Scientist, III, 1887, No. 24, p. 98.—VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, p. 106.

Series of large dorsal scales narrow, embracing seven rows of uniform size; the scales smaller than the smooth abdominals, keeled, those posterior larger than those in the anterior part of each row. Laterals minute, flat; caudals largest of all, very strongly keeled; antibrachials and prefemorals larger than dorsals, keeled. Two dermal folds on each side, and a strong one in front of gular fold, besides a few cross folds in front of shoulder. Ear large, with three small fringe scales. Lateral occipitals small; frontal long, undivided, preceded by five large scales, of which the posterior pair is in contact on the median line. Five rather broad supraorbitals, separated from marginal row by minute scales. Infralabials, five on each side, large, separated by one row of smaller scales from labials; the anterior pair in contact. Eleven and twelve femoral pores. End of muzzle to ear, 10.4 mm.; from ear to vent, 36 mm.; vent to end of tail, 79 mm.; anterior limb, 19 mm.; posterior, 29 mm.; hind foot, 14 mm.

Brown above, sometimes very dark, with seven short, lateral, black

cross bands, sometimes light edged behind, on each side, never confluent across the median line. Tail black or blackish brown. Head above lighter, with a few superciliary brown specks or cross lines. Each side of abdomen blue from axilla to groin, deepest and nearly meeting other side on the median line. Throat in males orange.

This species is nearest *U. graciosa*, of the Colorado region, but has a shorter muzzle, broader front, and other distinguishing traits. It was found in considerable abundance with *U. stansburiana* and *thalassina*.

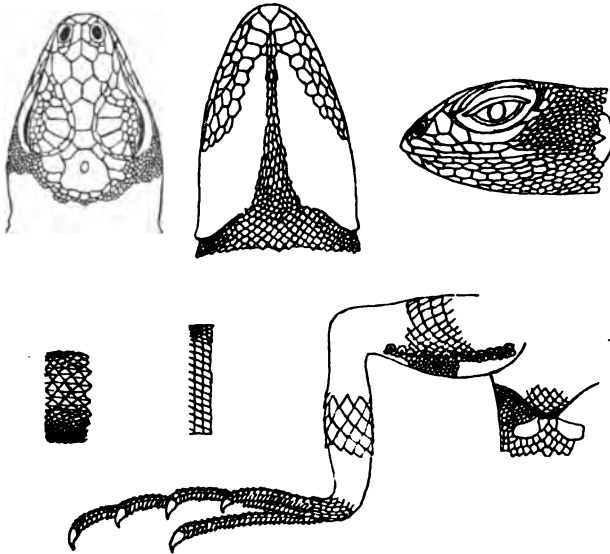


Fig. 44.

UTA NIGRICAUDA COPE.

× 2.5.

La Paz, Lower California.

Cat. No. 12614, U.S.N.M.

Uta nigricauda Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
5307	12	Cape St. Lucas, Lower California.	.....	John Xantus.....	Alcoholic type.
5245	1	do .....	.....	do	Alcoholic.
12614	10	La Paz, Lower California	Feb. —, 1882..	L. Belding.....	do.
15588	1	Cape St. Lucas.....	.....	John Xantus.....	do.

This small species is abundant in Lower California. Van Denburgh, who has seen many of them, says:

There is a very great amount of variation in the size, shape, and number of the head plates, even the frontal being sometimes divided transversely. The largest dorsal scales are along the median line. They are replaced, sometimes gradually and sometimes abruptly, by granules on the sides. Seventeen to twenty-four of the largest dorsals are equal to the length of the head to the posterior edge of the inter-

parietal (occipital) plate. The ventral scales are larger than the dorsals and perfectly smooth. The caudals are the largest of all and are very strongly keeled and mucronate. The number of femoral pores varies from nine to thirteen. The color of the throats of the males varies from canary yellow to deep Chinese orange.

This species was referred to by Professor Baird as *Uta ornata*.¹

UTA PARVISCUTATA Van Denburgh.

Uta parviscutata VAN DENBURGH, Proc. Cal. Acad. Sci., 1894, p. 298 (*microscutata*); 1895, p. 106, pl. VIII, figs. E, G; pl. IX.

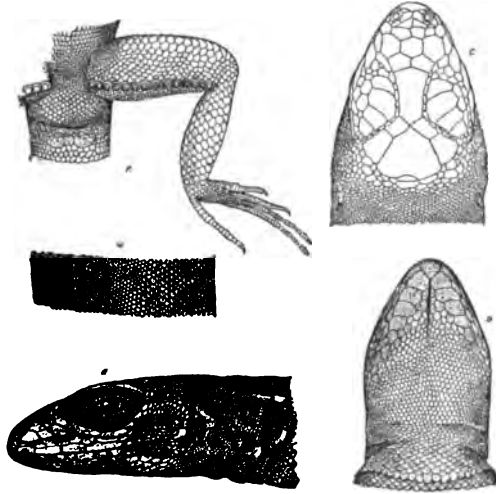


Fig. 45.

UTA PARVISCUTATA VAN DENBURGH.

× 2.5.

Lower California.

From Van Denburgh.

The following is the description given by Mr. Van Denburgh in the publication above cited:

Two specimens of *Uta* from Lower California, while manifestly related to *U. nigricauda*, as shown by the presence of a single frontal, the general style of the dorsal lepidosis, and the coloration, differ so much from that species (by the small size of the dorsal scales, the very gradual change from the largest dorsal scales to the granular laterals, the blue instead of orange gular patch in the male) as to make their separation imperative.

A single frontal; four large supraoculars; one large and two small projecting scales on the anterior border of the ear. The largest dorsal scales are along the median line, on each side of which they become gradually smaller, until a granular form is assumed, at a distance varying from four to seven rows of scales from the median line. Thirty-four of the largest dorsal scales equal the length of the shielded part of the head. A slight dermal fold extends from above the thigh to near the upper end of the oval ear opening. There is a strong gular fold, edged with rounded scales, which are slightly larger than those just in front. The dorsal and posterior

¹ Proceedings, Philadelphia Academy of Natural Sciences, 1859, p. 299.

surfaces of the thighs and the posterior surfaces of the arms are finely granular. The other portions of the limbs are covered with scales, which are smooth on the ventral surfaces of the thighs, legs, arms, and forearms, but keeled elsewhere. Scales on ventral parts of body smooth. Scales on back of tail much larger than those below, both strongly keeled. Femoral pores, fourteen on the left side, thirteen on the right. Enlarged postanal plates present.

Color sooty black, slightly paler below. Back with a few irregularly scattered light spots, and with nine pairs of faintly marked vertebral bars of a deeper black. Chest and belly indigo; chin and throat azure; pre- and post-anal regions tinged with azure.

Length of head and body, 45 mm.; of tail, 84 mm.; of hind leg, 31 mm.; of fore leg, 21 mm.; of hind foot, 13 mm.; of shielded part of head, 10 mm.; of head to posterior border of ear, 11 mm. Depth of head, 6 mm.; its greatest width, 8 mm.

Adult male (Type, No. 1221, Leland Stanford Junior University Museum, collected by J. M. Stowell, in the San Pedro Martir Mountains, Lower California, June 20 or 21, 1893).

Adult female (No. 1222, Leland Stanford Junior University Museum, collected by J. M. Stowell in the San Pedro Martir Mountains, Lower California, June 20 or 21, 1893). Differs from male in having thirty-two instead of thirty-four dorsal scales equal to the shielded part of head, and in having fifteen femoral pores. The general color is slaty gray, almost white below. Back with dark markings, as in male. A gular patch of lemon yellow.

This species approximates Section C of the genus in the increased number and smaller size of the dorsal scales. The larger dorsal scales are, however, far less numerous than in *U. stansburiana* and *U. palmerii*, there being only eight to fourteen rows, as compared with twice as many in the latter. The blue colors also ally it to Section D.

The name applied to this species by Mr. Van Denburgh being a hybrid, I am compelled to modify it so as to express what the discoverer and namer of the species intended to express.

UTA GRACIOSA Hallowell.

Uta graciosa BAIRD, U. S. Mex. Bound. Surv., Reptiles, 1859, p. 7; Proc. Acad. Nat. Sci. Phila., 1854, p. 92.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 213.

Urosaurus graciosus HALLOWELL, Proc. Acad. Nat. Sci. Phila., VII, June, 1854, p. 92; Rept. U. S. Expl. Surv. Pacific R. R., X, Pt. 4, 1859, p. 4, pl. VII, fig. 1.

About one-third the body and head very slender; excessively elongated tail. Head depressed, rather broader than deep; additional plates on the rostrum. Large dorsal scales in about six quite regular and equal series, not embracing much smaller ones.

Color above light ashy gray, with sometimes a reddish tinge. On each side a series of narrow, transverse, dusky bars, sometimes widening above; a more distinct band on each side the neck. Beneath white, veined with short, mottled, grayish lines. Male with the sides of belly blue, spotted with whitish.

The body of this species is very slender, the tail much elongated and greatly attenuated, being about ten and a half times the head and body. This is cylindrical at base, but soon becomes decidedly compressed, the section being vertically elliptical to near the tip, where it is more rounded again.

The head is narrow and high; the width equal to the distance from snout to beginning of large occipital, or three-fifths the length of lower jaw. The snout is rather pointed. The occipital is margined behind by three or four irregular series of small plates, larger than those on the nape. There are two lateral occipitals, which are displaced by a linear extension from the occipital in contact with the first vertical. The order of succession of cephalic plates, beginning with the first vertical, is 1, 1, 3, 3, 5, 5, 6, and ten large internasals besides the ten behind each nasal. The nasal plate is free, as in *Uta ornata*, the rim projecting beyond the encircling plates. The nostrils are oval, and longitudinal, instead of oblique. There are two rows of very small plates on the inner margin of the supraorbital region, as in other *Utas*, one sometimes wanting anteriorly. There are three series of large transverse plates,

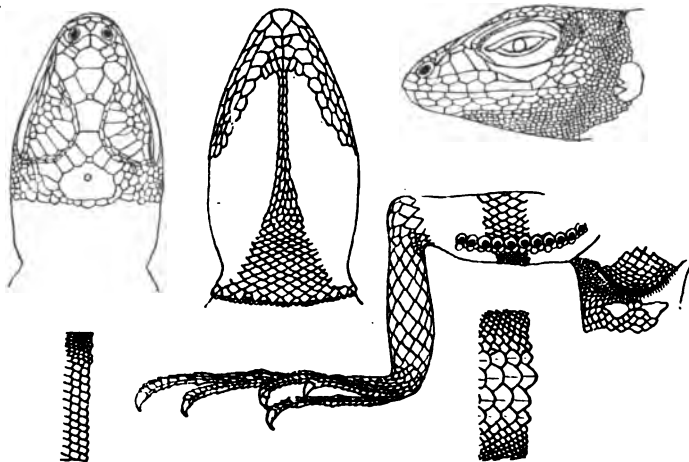


Fig. 46.

UTA GRACIOSA HALLOWELL.

× 2.5.

Southern California.

Cat. No. 8665, U.S.N.M.

diminishing successively in width and length from the innermost, which is largest. Exterior to all is another smaller series within the angular imbricated plates on the extreme edge.

The neck is comparatively smooth, with but few folds. There is little or no indication of any constriction anterior to the fold on the lower part of the throat, and the lateral pit is very faintly indicated. The large carinated rhomboidal scales on the back are in about six series of nearly uniform width, and without any conspicuously smaller ones interspersed either irregularly or along the central line of the back. The scales on either side of this central series (occupying about half the width of the head) are abruptly much smaller, but show an occasional larger scale along the crest of the lateral folds of skin (separated by about the width of the head). The legs are rather long, though the

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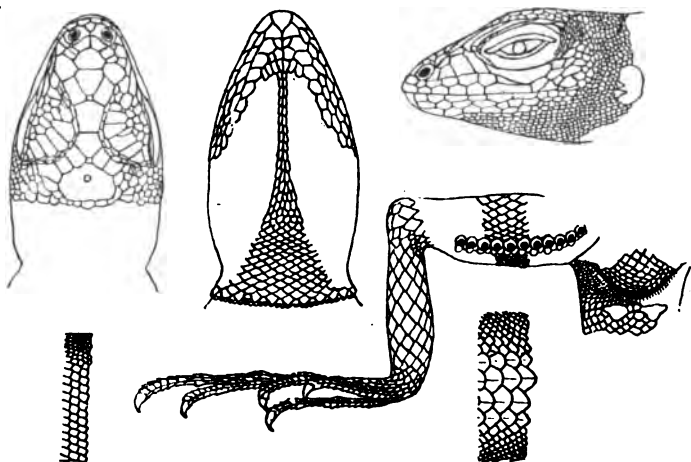


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hind foot is not one-third the head and body. The free part of longest toe reaches to the end of large occipital from the snout. The claws are short.

The prevailing color of this species above is a light yellowish gray or ash, occasionally with a pale reddish tinge. The sides (to the belly) are marked transversely with narrow well-defined blackish lines or vertical bars, those of opposite sides separated along the back by the central three or four large scales, and their upper end sometimes extended with short longitudinal lines. There is an occasional tendency to anastomoses of adjacent lines. Six or eight of these lines may be counted between the legs and anterior to the forearm. Starting on the shoulder is another, more distinct, forming a distinct cervical lateral band. There is a pale border to some of these bars, especially to the cervical one. The shoulder shows the dark lines. On the sides and back of the neck and sides of the head are numerous alternating faint white and brown longitudinal lines. The under parts, including the vent, are whitish, quite conspicuously marked with small spots and short, generally longitudinal, lines of dark gray, formed by minute dots on the scales. In the male there is a large light-blue patch on each side of the belly extending from fore to hind leg, becoming more intense anteriorly, the two separated on the middle line by from one to three rows of scales. These patches and the adjacent sides are distinctly and closely spotted with white, arranged so systematically as posteriorly to have the appearance of occupying the meshes of a network of plumbeous gray, tinged more or less with blue. There is little or no trace of blue on the chin, where the gray lines exhibit a tendency to anastomoses. There are indistinct transverse bands on the tail (interrupted below). The legs are also banded transversely.

The female lacks the blue of the belly, and exhibits an interrupted dusky stripe on the sides, in continuation of one beginning back of the eye and running along the upper edge of the ear.

There is little difference in form between this species and *ornata*, except in the more elongated body and longer tail. The lengthening of the head is accompanied by an increase in the number of cephalic plates. Thus the occipitals are more extensively margined behind, having two or three more of small plates instead of one. There is also a greater number anterior to the central verticals, although these vary a good deal. There are, in general, where the symmetry of arrangement is preserved, five transverse series to the internasals (which make six). Some specimens, however, are scarcely different from *ornata* in this respect. The tail is much longer, being two and one-half times instead of one and one-half times the head and body. The dorsal large scales are more regular, having no small ones interspersed.

The colors are lighter; the lateral bands narrower; the blue of the belly better defined and lighter, also more conspicuously spotted with white behind.

Concerning the distribution of *Uta graciosa*, Stejneger in his report on the reptiles of the Death Valley Expedition, states:

The known range of this well-named species has been considerably extended by the few specimens brought home by Dr. Merriam, inasmuch as it carries it into Nevada, the first record for that State.

Uta graciosa has a very peculiar and considerably restricted distribution, for the only definite localities so far recorded show it to be an inhabitant of a narrow strip of country on both sides of the Colorado River, probably from its mouth up to the beginning of the Great Canyon, and, as now shown, some distance up the Virgin River.

Dr. Merriam in the same publication remarks:

This slender and agile lizard was not seen in any of the deserts of southern California or Nevada, except in extreme eastern Nevada, where it was common at the Great Bend of the Colorado; thence northward it was found in a few places in the valley of the Virgin as far north as the Mormon town of Bunkerville, a few miles from the northwestern corner of Arizona. It was never seen on the open desert but usually on mesquite trees and the faces of cliffs, over which it moves with grace and agility.

Uta graciosa Hallowell.

Catalogue No.	Number of specimens.	Locality.	Date.	From whom received.	Nature of specimen.
2978	1	California.....	.....	Dr. C. L. Hermann	Alcoholic.
2747	8	Colorado Desert .....	.....	H. B. Mulhausen	do.
18505		Bunkerville, Nevada.....	May 8, —	Bailey	do.
18506		Callville, Nevada (Great Bend of Colorado).	May 4, —	Merriam	do.
18507		do	do	do	do.
15962		Yuma, Arizona .....	.....	U. S. Fish Commission	do.
15947-8		Fort Yuma, Arizona .....	.....	do	do.
15962		Yuma, Arizona .....	.....	do	do.
16801-2		Parker, Colorado River, Indian Agency, Arizona.	.....	George A. Allen.....	do.
21730		Gila City, Yuma County, Arizona.	.....	Dr. E. A. Mearns	do.

LYSOPTYCHUS Cope.

Lysoptychus COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 397.

A loose fold across the throat formed by the conjunction of the prehumeral folds, as in *Otenosaura*, not closely folded nor bordered with enlarged scales. Femoral pores; no preanal pores. No dorsal crest. Tympanic disk exposed.

This genus is intermediate between *Sceloporus* and *Uta*. The loose dermal neck-fold, like that of some of the larger genera of Iguanidæ, is not found in the former. The tightly adherent collar of *Uta* might have been developed from a *Sceloporus* through a *Lysoptychus*.

But one species of this genus is known.

LYSOPTYCHUS LATERALIS Cope.

Lysoptychus lateralis COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 397.

Integument of side of neck thrown into numerous folds. The most prominent is continuous with the collar fold, and it sends out two folds forward to the tympanic meatus. A second fold is concentric with the humerus at its anterior base; its superior part is prominent and longitudinal, and continues to the fold in front of it. Tail round.

The scales of the sides are smaller than those of the belly, which are smaller than those of the back. The latter are rather small, counting seventeen longitudinal rows between the small lateral scales of the

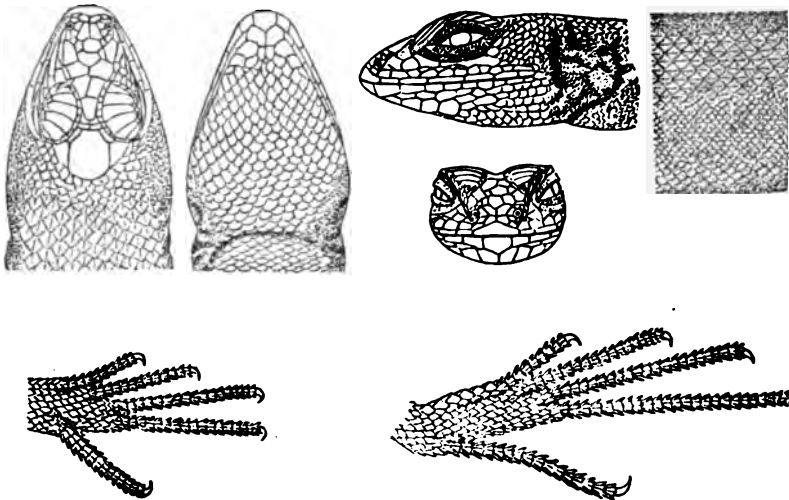


Fig. 47.

LYSOPTYCHUS LATERALIS COPE.

× 2.

San Diego, Texas.

scapular regions. The keels of the dorsal scales are in parallel lines. Scales of the tail subequal, strongly keeled, except below. Fifteen femoral pores. Two postanal plates.

Interparietal plate large, subround; parietals small, subpyriform, one fifth as large as the interparietal. Five or six transverse supra-orbital plates, separated from the frontals by one row and from the superciliaries by two rows of scales. Frontal divided transversely, the anterior part divided longitudinally. These plates are preceded by two plates, and these by three in transverse relation; two large internasals separated from the rostral by two small scales. All the scales of the head smooth.

Color above brown, with faint traces of small darker brown spots. Sides blackish, the prominent parts of the folds of the neck paler.

Anterior border of meatus auditorius paler. A large blue patch on each side of the belly extending from axilla to groin, and not meeting its fellow on the middle line. Throat yellowish, faintly reticulated with blue. Posterior face of femur with a light band, bordered by dark above and below. A black spot on side over scapula.

Measurements.—Total length, 180 mm.; length to vent, 59 mm.; to collar, 15 mm.; of anterior leg, 27 mm.; of posterior leg, 44 mm.; of posterior foot, 21 mm.

This species is about the size of the *Sceloporus consobrinus*. It seems to be rare, as Mr. Taylor took only one specimen.

Lysoptychus lateralis Cope.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
1	San Diego, Texas.....	William Taylor.....	Alcoholic.

SCELOPORUS Wiegmann.

Sceloporus WIEGMANN, Isis, 1828, p. 369; Herpt. Mex., 1834, p. 48.—FITZINGER, Rept. Syst., 1843, p. 75.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 167.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 216.

Tropidolepis CUVIER, Reg. Anim., 2d ed., II, 1829, p. 38.—DUMÉRIL and BIBRON, IV, 1837, p. 294.—FITZINGER, Rept. Syst., 1843, p. 76.—GRAY, Cat. Liz., 1845, p. 208.

Tropidurus WAGLER, part, Syst. Amph., 1830, p. 146.

No gular constriction; one lateral fold on the neck. Femoral pores. Scales all imbricated; rhomboidal, rather verticillate on tail; above generally carinated. Head above with regular plates. Superciliary plates imbricate toward a median keystone scale; labials not imbricate. Ears distinct. Nostrils superior within the canthus rostralis. Tongue fleshy; arrow-shaped; rounded at tip; broadly adherent, except at end, where are two triangular disks beneath. No palatine teeth. Cheek teeth compressed, the summit 3-lobed. Tail rounded, very brittle.

The genus *Sceloporus* consists of terrestrial, and therefore depressed thoracopleurous Iguanidæ, with flat scales and distinct parietal scuta, and femoral pores, without preanal pores and gular, dermal fold, or collar. Its especial habitat is Mexico and Central America, the southwestern parts of the United States and California. A single species ranges over the entire eastern district of the Neartic Realm. Outside of the districts named it does not occur.

Osteology.—As a basis for an examination of the osteology of this genus I have before me two skeletons of the *S. undulatus* and one of the *S. spinosus*, from the U. S. National Museum.

The premaxillary bone has a long superior spine, and is truncate on the palatal face, and has the button-like process. The nostrils are partially vertical, so that the nasals are a little shortened in front. The latter are rather large and are distinct. The frontal is simple and nar-

row and is strongly grooved on the middle line below. The parietal is short and wide, and is perforated by a large pineal foramen, which touches the coronal suture. Parietoquadrate arch distinct. Supra-occipital broadly but loosely attached, confluent with exoccipitals. Prefrontals large, not reaching postfrontals above; lachrymal small and joining jugal. Postfrontal a small splint; postorbital large, extensively in contact with jugal and supratemporal. Paroccipital small. Vomers short, divaricate, and separated by a deep notch behind. Palatine with the vomerine process longer than the maxillary; palatine foramen large. Palatines and pterygoids well separated from each other on the middle line; ectopterygoid deflected at its internal extremity. Basipterygoids developed. Quadrate with two conchs, the internal the narrower. Presphenoid rudimental; sphenoid and basioccipital coossified; descending lateral processes of the latter strongly developed. The supraforaminal part of the petro-al is very short; the infraforaminal portion is produced beyond it and is nearly horizontal in position. The foramen of eighth nerve is at the bottom of a fossa. Epipterygoid resting on pterygoid much posterior to ectopterygoid and reaching parietal without touching petrosal. Occipital condyle not subdivided by grooves.

The hyoid system includes a pair of well-separated, short, second ceratobranchials, and rather long and slender first ceratobranchials and ceratohyals, which have no expansions. Hypobranchials moderate, supporting ceratohyals at extremities.

Mandible with Meckel's cartilage exposed at the distal part. Coronoid not horizontally produced on external face. Articular and surangular united. Splenial moderately elongate; dentary extending behind coronoid on external face and deeply notched. Angle short, horizontal, with short internal angle. Five cervicals with intercentra in *S. undulatus* and six in *S. spinosus*; three without ribs in both. Ribs extending to sacrum. Sacral centra not coossified. Sacral diapophyses coossified distally; the second with a posterior free angle distally. Caudal diapophyses well developed at base of tail. From about the eighth caudal the centra are segmented in front of the middle.

Scapula with proscapular process; coracoid with one notch. Sternum with a very large fontanelle. Two ribs join the sternal plate; one comes off the base of the xiphoid rod, and two articulate with the latter; total, five pairs. The ilium has a small *angulus cristæ*, and the acetabulum is not emarginate behind. The pubes are nearly transverse, and the pectineal angle is external. The ischia are rather slender, and the tuber is an angle.

The middle and posterior teeth are feebly tridentate; the others are simple.

Viscera.—The liver is deeply emarginate posteriorly, and the left lobe is larger than in many other genera of Iguanidæ. There is a distinct colon. The mesenteries are of the type most common in Sauria with the exception that there are commonly two hepatoventral sheets.

The hemipenis is bifurcate, and has a strong welt opposite to the sulcus spermaticus. The surface of the organ including the welt is covered with a rather close honeycomb structure without the interruptions seen in the genera more nearly allied to *Iguana*, etc.

Reproduction.—The males are generally more brilliantly colored, and larger than the females. The latter are generally oviparous, but the species *S. viviparus* of the warmer parts of Mexico is viviparous.

The species agree in possessing the following external characters: Head, depressed, tetrahedral, rather broad; behind the forehead, sloping. Canthus rostralis continued nearly to the end of the snout; the nostrils superior; plates on the top of head large, not many in number, and quite symmetrically arranged. The supraorbital region, with one or two central series of large transverse plates, bordered internally by one, externally by one or two series of small plates independently of the elongated, angular ones forming the extreme edge of this region or part of the canthus rostralis. There is a large occipital, with a smaller on either side, sometimes with a line of two or three. Next comes two plates between the orbit, sometimes with a smaller interposed, sometimes displaced by the occipital. Next a vertical, followed by a second, which is sometimes divided into two lateral. Then come two plates, then three, then four to the nasal plates, with four between them. An additional rostral median plate is sometimes inserted, around which are grouped four or five scales; this involves a different arrangement of the remaining ones. The nostrils themselves are rounded and situated in the center of a single nasal plate.

There is no fold on the throat, the scales there being like those on the breast. There is, however, an oblique fold of skin on each side the neck covered with large scales and overlying a pit lined with fine granular scales and usually harboring Acari.

All the scales on the body are ovate, imbricate, and generally strongly carinated, except below. The upper ones generally have a prominent spine behind, and the edges are more or less denticulated, rarely even. The scales of under surface are usually notched or emarginate between. They are sometimes faintly carinated, with those on the inside of tibia. The relative proportions of scales on different parts of the body varies considerably with the species.

The ears are distinct, usually with a serrated margin anteriorly. There are eight to twenty femoral pores, but no anal ones. The male has two or more large concave plates just behind the anus, which are wanting in the female.

The color varies with the species, though there is generally a light lateral stripe (sometimes two) on each side. The back is marked with transverse dark lines or with blotches. The males have a blue blotch on the under surface and on the sides of belly.

The species are rather numerous. Since Wiegmann described the most abundant of the Mexican species, synopses have been published

by Duméril and Bibron, Bocourt and myself. Bocourt has published also, in the Report of the Mission Scientifique of Mexico, most admirable plates of many of the species. I have given a synopsis of the species,¹ twenty nine in number. The material which has furnished the basis of the present work is largely the property of the U. S. National Museum at Washington. It has been furnished by the following naturalists: Messrs. Riotte, Van Patten, Hague, Berendt, Sumichrast, Xantus, Sartorius, Dugès, Potts, and Major. On my own part, I have received specimens from Messrs. Dugès, Hoege, Ferrari-Perez, Villada, Herrera, and Bernad. To all of these gentlemen I wish to extend my thanks for their kind attention in the matter.

The distinction of many of the species of this genus is not accomplished without difficulty. I recommend it as an excellent *pièce de résistance* for those persons who do not believe in the doctrine of derivation of species. There are some characters, it is true, which are not subject to such variation as to be embarrassing. Such are the greater or less number of femoral pores, and the granular lateral scales of some of the species. The carination and wrinkling of the head scales is frequently a valid character, but is especially unreliable in the *S. undulatus*, and one or two other species. The size of the dorsal scales varies in most of the species; the number entering a head length varying two to three in the large-scaled species, and three or four in the small-scaled ones. The division of the supraocular plates into two or more rows is constant in a few species only; in others it is variable, notably in the *S. torquatus*. The longitudinal division of the anterior frontal is constant in the *S. variabilis*, *S. siniferus*, and *S. squamosus*, but is present or absent indifferently in several others. The number of supraoculars in the principal row may be four or five in most of the species.

The greatest difficulty is experienced in distinguishing the North American species. They are much fewer in number than has been represented to be the case, and the few that are admissible do not present the strong characteristics that most of those of more southern regions do. The *S. undulatus* has an almost continental distribution in North America, within the range of temperate and subtropical climates.

The arrangement of numerous species of the genus into groups is a matter of much difficulty, owing to their gentle gradations of form and the sometimes slight difference in color. The number and arrangement of the supraorbital plates and the verticals furnish good characters, though sometimes varying somewhat in the species. The arrangement of the cervical plates can not be relied on entirely for specific characters, although the average is much the same in the species.

While the species of *Sceloporus* possess brilliant colors, these are generally on the inferior surfaces and are therefore concealed. The throat and sides of the belly are usually of some shade of blue (sometimes purple), while the dorsal regions are, in a majority of species, different

¹ Proceedings of the American Philosophical Society for 1885, p. 400.

shades of brown, although in some (as *S. malachiticus*) this region also is of some shade of green or blue.

When the animal raises the head, as it habitually does, the brilliant colors of the throat are visible, but those of the sides are much less apparent. All these colors are most conspicuous in the males, and in many species they are absent from the females. They are to be regarded as secondary sexual characters, and are probably visible to the females at the time of copulation, since the inferior surfaces of the sexes are then in juxtaposition.

The species of *Sceloporus* are conspicuous objects wherever one travels in the southern United States and Mexico. In the eastern district of Nearctica the *S. undulatus* is seen running on fences and walls. In Texas the *S. spinosus* runs up trees with great activity, dodging the pursuer behind branches, with good result to himself. In southern Texas and in Mexico *S. torquatus* is constantly seen on the vertical faces of rocks that so frequently border the highways, hiding in fissures from enemies, and often attracting the attention of the most careless observer. Throughout Mexico the *S. microlepidotus* runs over the horizontal rock surfaces and stone walls, where it finds concealment. So the *S. scalaris* haunts the soil and sand, and hides in holes that are always convenient.

Thirty-four species are known to me, and are distinguished in the following analytical table. About half of them belong to Nearctica and half to the Central American region of Neotropica. None are found elsewhere. In Costa Rica at one extremity of the distribution there is but one species (*S. malachiticus*), and there is but one in the eastern region of Nearctica (*S. undulatus*).

I. Supraocular plates separated from supraorbitals by a row of scales, and from superciliaries by one or more rows of scales distinct in form from the latter.

A. Lateral scales granular.

Femoral pores more than 10; head plates carinate, frontal longitudinally divided; parietals 2, canthals 2; dorsal scales moderate, uniform, 10 in a head length..... *S. utiformis* Cope.
Dorsal scales interrupted by smaller ones on the median line..... *S. heterolepis* Boulenger.

AA. Lateral scales squamous, in longitudinal series, like the dorsals.

Femoral pores more than 10; head plates carinate, frontal single, 2 scales on canthus; light stripes separated by brown spots above.

S. scalaris Wiegmann.

AAA. Lateral scales squamous, in series directed upward and backward; dorsals parallel.

B. Head plates carinate or wrinkled; frontal divided longitudinally.

α. Femoral pores less than 10.

Facial scales keeled; laterals smaller than dorsals; 2 canthals; 2 parietals; colors bright.

S. siniferus Cope.

Facial scales keeled; laterals smaller; 2 parietals; 1 canthal; colors dull.... *S. squamosus* Bocourt.

αα. Femoral pores exceeding 10.

One scale on canthus rostralis; 1 parietal; 12 dorsal scales in a head length; dorsal stripes and lateral spots yellow.....*S. chrysostictus* Cope.
Two canthal scales; lateral scales small; 2 parietals; dorsal stripes yellow, side patches pink-purple.....*S. variabilis* Wiegmann.

BB. Head plates smooth, or if rarely wrinkled, the frontal plate not divided.

α. Scales small; 12-22 in a head length.

β. One row of large supraoculars, with laterals.

Two or three parietals; frontal divided; nineteen scales in a head length; lateral scales much smaller than ventrals; 17-20 femoral pores; a black shoulder patch; a pale dorsolateral band.
S. couchii Baird.

Two parietals; lateral scales equal ventrals; twelve dorsals in a head length; forty-five from occiput to groin, mucronate; dark green above.
S. candenburgianus Cope.

Three parietals; 14-15 scales in a head length; color in longitudinal bands; frontal undivided.
S. graciosus Baird and Girard.

ββ. Two or more rows of flat supraoculars.

Three or two parietals; 12-15 scales in a head length; no bands.....*S. grammicus* Wiegmann.

Three parietals; 18-22 scales in a head length; color in narrow cross lines.

S. microlepidotus Wiegmann.

Two parietals; fifty non-mucronate scales between occiput and groin; a black light-bordered collar.....*S. ornatus* Baird.

αα. Scales larger; ten and fewer in a head length.

εε. Thirty to forty rows of scales between occiput and groin.

ζ. Dorsal scales not mucronate.

Two canthal scales; two rows of larger supraorbitals; frontal undivided; two parietals; a complete black pale-bordered collar.*S. jarrovi* Cope.

ζζ. Dorsal scales mucronate.

η. One canthal scale; one row of large supraoculars.

θ. No black neck collar.

One large parietal; large supraoculars undivided; males blue green with black throat.

S. malachiticus Cope.

ηη. A black neck collar.

"Collar incomplete above; head less than one-fifth of length of head and body; throat blue;"
Bocourt.....*S. lunæi* Bocourt.

Collar very narrow, not pale bordered, a little interrupted above; head less than one-fourth of head and body; throat dark slate, yellow spotted.....*S. ferrariperæzi* Cope.

Collar complete, yellow bordered before and behind; head about one-fifth head and body; throat, belly, and groin black.

S. melanogaster Cope.

55. Two canthal scales.

7. No black neck collar.

6. Two or more parietals.

Two rows of large supraoculars; scales large, subequal; green, a black shoulder patch.

S. taeniocnemis Cope.

One row of large supraoculars; scales large, subequal, eight in a head length; abdominals and inferior tibials smooth; green, a black shoulder patch.....

S. viviparus Cope.

One row of large supraoculars; scales subequal, smaller; eleven in a head length; abdominals and inferior tibials keeled; brown, with lateral stripes.....

S. thayeri Baird and Girard.

66. One parietal (sometimes postparietals).

Scales of sides of neck and shoulder smaller; 20 femoral pores; two rows of dorsal spots.

S. biseriatus Hallowell.

Scales of side of neck and shoulder smaller; 44 dorsal rows of scales, 9-10 in a head length; femoral pores 12-17; males crossbarred, females banded; head plates sometimes wrinkled.

S. undulatus Latreille.

Like *undulatus*, but larger; scales larger, dorsals in thirty-three rows; femoral pores ten; brown spotted above, throat not blue.

S. spinosus Wiegmann.

77. A black neck collar.

"One large row of supraoculars; dorsal scales strongly mucronate; throat and sides of belly blue; collar complete, not light bordered."

S. acanthinus Bocourt.

One or two rows of large supraoculars; dorsals not or but little mucronate; collar complete, light bordered; sides of belly blue, throat greenish or spotted.....

S. torquatus Greene and Peale.

AAAA. Both dorsal and lateral scale rows converging posteriorly.

Forty-three scales between occiput and groin; two canthal scales; two rows larger supraoculars; collar a narrow black line directed backward from each shoulder, pale bordered behind, mostly interrupted; throat not blue..

S. dugesii Bocourt.

One canthal scale; very few scales between large supraoculars and superciliaries; two small parietals; two rows of blue spots on belly.

*S. pyrrhocephalus*¹ Cope.

II. Supraoculars separated from supraorbitals by a row of scales; from superciliaries by lanciform scales like superciliaries.

A. Dorsal rows parallel, laterals large, oblique.

B. One parietal and two canthal scales.

A black collar; seven scales in a head length; head scales smooth; back not cross-banded.

S. serrifer Cope.

No black collar; twelve scales in a head length; head scales smooth; inferior tibial and postanal scales smooth; cross-banded..

S. tristichus Cope.

¹ Many specimens of this species enter Division II.

III. Supraocular plates only partly or not separated from supraorbitals by a row of scales, and separated from superciliaries by but few scales.

A. Femoral pores from two to six; external supraoculars lanceolate.

Facial scales smooth; supraoculars wide; one parietal plate; two canthals; no collar,

S. horridus Wiegmann.

AA. Femoral pores exceeding 10 in number; external supraoculars squamiform.

α. Two parietals.

Scales not keeled, serrate; seven in a head length; dark, with narrow pale cross-bands; scales with small spots of various colors.

S. orcuttii Stejneger.

Scales keeled, 6-7 in a head length; parietal scales wider than interparietal; back with broad reddish longitudinal bands.....*S. zosteromus* Cope.

αα. One parietal.

Scales keeled in thirty-two dorsal rows from head to tail; a cervical black collar interrupted above; back crossbarred with brown or spotted.

S. clarkii Baird and Girard.

Scales large, carinate, seven in a head length; parietal plates wider than interparietal and all wider than long; head yellow; muzzle black,

S. melanorhinus Bocourt.

The genus *Sceloporus* in Nearctica belongs especially to the Sonoran region. No species has a range exclusively outside of that region in any other part of Nearctica, with the possible exception of a species or two in Lower California and the *S. thayerii* in southwest Texas. *S. torquatus*, *S. spinosus*, *S. variabilis*, and *S. scalaris* are not Sonoran species, but they are Mexicans which pass over our borders. From the Sonoran center *S. undulatus* radiates in one form or another all over the continent south of the Canadian district. *S. graciosus* ranges the whole length of the Great Basin, and *S. clarkii*, in its forms *S. lickii* and *S. zosteromus*, into and to the end of the Lower Californian Peninsula. The only possible exception to the above statement is the *S. orcuttii*, which is found near the coast in southern California, and with a few other species of reptiles characterizes a limited district, whose distinctness is so far uncertain. In Nearctica the distribution of this genus is closely similar to that of *Cnemidophorus*.

The geographical distribution of the species, so far as now known, is as follows:

I. FAUNA NEARCTICA.

a. EASTERN REGION.

S. undulatus Latreille.

b. AUSTRORIPARIAN REGION.

S. undulatus Latreille, *S. spinosus* Wiegmann.

c. CENTRAL REGION.

S. undulatus Latreille, *S. biserialis* Hallowell, *S. graciosus* Baird and Girard, *S. consobrinus* Baird and Girard.

d. PACIFIC REGION.

S. undulatus Latreille.

e. DIEGAN REGION.

S. orcuttii Stejneger, *S. vandenburgianus* Cope, *S. biserialus* Hallowell, *S. zosteromus* Cope, *S. liokii* Van Denburgh.

f. SONORAN REGION.

S. clarkii Baird and Girard, *S. couchii* Baird and Girard, *S. jarrovi* Cope, *S. ornatus* Baird, *S. dugesi* Bocourt, *S. minor* Cope, *S. microlepidotus* Wiegmann, *S. grammicus* Wiegmann, *S. scalaris* Wiegmann.

g. ST. LUCAS REGION.

S. zosteromus Cope.

II. FAUNA NEOTROPICA.

a. CENTRAL AMERICAN REGION.

1. Tampican subregion.

S. variabilis Wiegmann, *S. æneus* Wiegmann, *S. viviparus* Cope, *S. torquatus* Baird and Girard, *S. serrifer* Cope, *S. microlepidotus* Wiegmann, *S. grammicus* Wiegmann, *S. chrysostictus* Cope, *S. graciosus* Baird and Girard, *S. spinosus* Wiegmann.

2. Coliman subregion.

S. utiformis Cope, *S. pyrrocephalus* Cope, *S. melanorhinus* Bocourt, *S. horridus* Wiegmann, *S. siniferus* Cope, *S. microlepidotus* Wiegmann?, *S. torquatus* Greene and Peale? *S. heterolepis* Boulenger.

3. Plateau of Guatemala. Guatemalan subregion.

S. malachiticus Cope. *S. squamosus* Bocourt, *S. chrysostictus* Cope, *S. tantioenemis* Cope, *S. lunai* Bocourt.

4. Plateau of Costa Rica. Costa Rican subregion.

S. malachiticus Cope, *S. squamosus* Bocourt.

In this table is shown a gradual transition of specific distribution from the north to the south of the Central American region, some species being common to two districts. The same is true of the regions of the Nearctic realm, and were the divisions of the latter determined by the species of *Sceloporus* they would have no greater value than those of the Central American region of the Neotropical. They are, however, distinguished by differences in the distribution of other types of animals, and are of much greater significance than the divisions of the Central American region.

Several species of the genus inhabit the adjacent areas of both Faunæ. Thus *S. grammicus* and *S. microlepidotus* occur in both the Tierra Templada (*R. nearctica*) and Tierra Caliente (*R. neotropica*) of Mexico. The *S. variabilis* and *S. torquatus* extend from the eastern Tierra Caliente a short distance into Texas, and these species should perhaps be omitted from our fauna. The *S. spinosus* appears to be a full member of both of the great Faunæ, extending from the State of Puebla as far as Florida. The distribution of the *S. graciosus* is still more anomalous. It belongs to the central desert region of the *F. nearctica* as far north as Oregon, but I have seen specimens which I can not distinguish from it from near Jalapa, which is well south in the Tierra Templada of Vera Cruz. The proper geographical location of the *S. thayerii* Baird and Girard and *S. heterolepis* Boulenger is yet uncertain.

For further observations, see chapter on "Geographical distribution."

The North American species may be compared in greater detail as follows:

- A. Cephalic plates perfectly smooth. Supraorbital region with one crescentic series of very large plates, bordered externally and internally by a series of small ones, making three in all. Two verticals.
- Scales large, those on side of neck very spinous. Color grayish, without continuous cervical collar; back with median transverse bands.
- α. Inner row of supraorbital scales wanting behind.
- Color yellowish green. A black collar around neck, interrupted above. Dorsal dusky bars, with a tendency to two series of blotches behind.
- Scales of back in thirty-two series. Scales strongly carinated, pointed, and mucronate *S. clarkii*.
- Eighteen and twenty rows of scales between rump and nape; parietals wider than interparietal, which is not wider than long; lateral scales larger than abdominal. Yellow, with a wide red-orange band on each side, sometimes covering the entire back, the middle of which is marked by indistinct brown crossbars sometimes wanting; large *S. zosteromus*.
- αα. Inner orbital marginal plates continuous.
- Dorsal scales in thirty-three rows. Scales on inside of tibia carinated. Femoral pores 13. Free portion of hind toe shorter than cephalic plates.
- Color above greenish yellow, with two broad yellow stripes, five rows apart. Back with distinct transverse blackish bars. No blue on chin in males and but little on the side of belly *S. spinosus*.
- Dorsal scales in forty rows, well keeled and mucronate; interparietal wide as long; four preauricular free scales.
- A pale band on each side connected by undulating black crossbands. *S. aristichus*.
- B. Cephalic plates smooth. Supraorbitals in one large series of transverse plates, with one internal and two external of smaller ones equal in size, making four. Two verticals. No collar.
- Free portion of hind toe shorter than cephalic plates. Dorsal scales about equal to lateral; strongly carinated, spinous and denticulate. Belly scales notched. About forty-one series of scales from head to tail.
- Above yellow olive, with two lateral stripes on each side, the upper pair separated by eight rows of scales; a broad stripe along middle of back. A series of oblique dark lines above *S. consobrinus*.
- Free portion of hind toe equal to cephalic plates. Edge of dorsal scales rounded; scarcely mucronate or denticulated. Belly scales even. Dorsal scales in 50 oblique series. Dorsal scales larger than lateral.
- Above olivaceous gray, with two dorsal series of rounded blotches. No cervical collar *S. biseriatus*.
- Dorsal scales mucronate, in 41 rows from occiput to tail, about equal to lateral and ventral scales.
- Green, with a row of dark crescentic blotches on each side, the green sometimes restricted to bright spots on each side of the back *S. u. biseriatus*.
- C. Cephalic plates smooth. Two central series of subhexagonal supraorbital plates in series; the inner or larger twice as wide as the other, which is straighter, and embracing it in its concavity. There is, besides, an internal and generally two external series of very small plates, making five; the latter sometimes much confused.
- A light line from the back nearly perpendicular to the shoulders with a black one anterior to it, sometimes extended into a collar encircling the back of the neck. No longitudinal dark line from shoulder to head.
- a. A distinct, black collar complete above.

- Scales of back in about forty series, all well carinated, spinous and denticulate laterally. Scales of rump smaller than those of back. Femoral pores sixteen. Above dark green, cervical collar bordered before and behind by greenish yellow, the anterior border interrupted by black. A few spots on the nape and back *S. torquatus*.
- Scales of back in thirty-two dorsal series, the middle one very obsoletely carinated and scarcely mucronate or denticulate; semicircular. Femoral pores eleven. Above greenish yellow, with dusky, transverse bars. Cervical collar broadly margined before and behind by yellowish *S. t. poinsettii*.
- Scales of back in forty-two series; dorsal well carinated and mucronate, outlines straight. Femoral pores twelve. Color above dark green; the cervical collar without light margin and notched behind above. Back with rounded dark spots *S. t. formosus*.
- Scales of back in sixty-four rows; carination slight, with but little mucronation or denticulation. Femoral pores twelve. Above dark green, nearly black centrally. Nuchal collar broad, margined and banded with yellowish; back with small spots of the same *S. ornatus*.
- b. Collar inappreciable, not complete above.
- Scales about equal, abrupt, much smaller than caudal. Dorsal scales in eighty rows, longitudinal ridges above, nearly all converging along the dorsal line. Dark green above, with transverse waved lines of dusky above. A rectangular black patch on side of neck, bordered above and behind by light greenish. Sometimes a more distinct collar, interrupted above. Blue patches on each side of belly in male, separated narrowly by several rows of scales. Chin uniform bluish sprinkled with white. *S. microlepidotus*.
- Scales of body about equal, scarcely smaller than caudal. Dorsal scales in fifty rows. The longitudinal ridges on back more parallel. Middle supraoccipitals more unequal, less regularly hexagonal.
- Olive gray, with two distinct yellowish lines on each side, the upper separated by about eight or ten rows of scales. Two series of crescentic dark blotches on each side. A narrow, perpendicular, black line at the shoulder, with a white one behind. Male with the blue patches on belly widely separated. Head beneath banded obliquely on each side with bluish *S. graciosus*.
- D. Cephalic plates wrinkled at the end and sides of head. Supraorbital region with one crescentic series of large plates, embracing a short, straight one of small ones in its concavity. These, with an internal and external series of small plates, making four (sometimes five) in all. Two verticals. About forty-four rows of scales from head to tail. Scales behind thigh smaller than above. Dorsal scales from forty to forty-five. No collar.
- Back with undulating dark lines or double series of crescentic spots, but no cervical black collar. A longitudinal black patch on shoulder and a dusky stripe on the sides in the male.
- Scales inside of femur, carinated; of belly smooth. About forty-one rows of dorsal scales. Free part of long hind toe about equal to cephalic plates. Inner orbital series sometimes wanting.
- Very indistinct dorsal light stripes separated by about ten rows of scales. Back crossed by nearly continuous undulating lines. Sides dusky. Male with whole chin behind black, with two confluent blue spots. *S. undulatus*.
- Scales pointed, elongated, scarcely mucronate or denticulate. Femoral scales smooth inside. Dorsal scales in forty-four series. Femoral pores twelve. Free hind toe three-fourths the cephalic plates.
- Above olive gray, with two narrow yellow lines margined by black (on one row of scales) and twelve rows apart. Back with two series of crescents in contact. Two small spots at the shoulder. *S. scalaris*.
- E. Cephalic plates smooth or rough. Occipital plates laterally and behind, with plates larger than the dorsal scales and not belonging to their series. One large series of supraorbitals, with two external and one internal much smaller, making four. Only one single vertical.

α . Lateral scales much smaller than dorsal. Scales all very minute. A short, whitish line to the shoulder perpendicular to the lateral stripe. No black collar.

Plates of head corrugated. Scales on sides mostly in distinct oblique serial arrangement. Oblique dorsal rows of scales about seventy. Femoral pores twelve.

Plates of head wrinkled; anterior frontal divided; scales small, in sixty to eighty cross series between occiput and tail; lateral scales much smaller than dorsal, sharply defined from them.

Brown above, with generally a pale, longitudinal band on each side; throat and sides of belly blue, pale in the center in males. *S. variabilis*.

Plates of head smooth. Scales on sides mostly paved and granular. Oblique rows of scales above eighty. Femoral pores twenty.

Dark green above, with two lateral light stripes, separated by eighteen rows of scales. Back with irregular spots. Sides with a white band from groin. An obsolete patch on each side the belly, widely separated below. Sides of jaws transversely banded with blue and whitish, this arrangement extending on sides of chin. *S. couchii*.

$\alpha\alpha$. Lateral scales not minute; a black collar.

Plates of head smooth; dorsal scales in forty rows from head, very weakly keeled, not mucronate; femoral pores fifteen.

Bluish black above, the scales with a light center; a black collar, light bordered before and behind, connected with a dark, longitudinal band on the side of the head. *S. jarrovi*.

SCELOPORUS DUGESII Bocourt.

Sceloporus dugesii BOCOURT, Mission Sci. Mex. Rept., 1874, p. 188, pl. XVIII, fig. 7.—COPE, Proc. Amer. Phil. Soc., XXII, 1885, p. 396.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 224.

Sceloporus intermedius A. DUGÈS, La Natureza, Mexique, IV, 1876, p. 29, pl. I, figs. 21-32.

A rather large species with the body depressed. Upper cephalic plates smooth. Two scutella on the upper border of each angular ridge of the muzzle. Supraocular scales relatively small, a very little wider than long. On the anterior edge of the auricular border are flat scales a little wider than those in front. Scales on the back of average dimensions, obtuse, and feebly carinated; nine to twelve of these scales equal the length of the upper surface of the head. Scales on the flanks just a little smaller; those of the belly one-third smaller than those of the back. Tail covered with scales much larger than those on the back. Thirteen to fifteen femoral pores. Upper part of the body shaded from olive to dark umber, with a brown scapular collar border on the front edge with yellow. The males have the breast yellow and the sides of the abdomen blue.

Head relatively short, depressed, and wide through the temples; its length is a little less than one-fifth the distance from the chin to the anus. Seven polygonal prefrontal plates, the two anterior ones being much smaller than the others; two frontal plates; the first, rather large, is wide in front and slightly concave; the second is smaller, hexagonal, and is in contact at the posterior angle with the anterior angle of the occipital plate. This, in turn, somewhat larger, is narrow in front, having the lateral borders parallel, and is in contact, right and left, with a

fronto-parietal and a temporal scute. Supraocular scales polygonal, in two or three longitudinal rows, surrounded by scutella; those of the internal row are relatively large and are wider than long. Labial scales rectangular, eight above and ten below; above the upper ones there are one or two series of elongated, projecting scales. Auditory meatus bordered anteriorly with flat scales, wide and pointed, larger even than the keeled scales which border them in front. Scales of the neck and back short, obtuse, with the keel not prolonged and the notch indistinct; they are arranged in from forty-four to forty-eight oblique rows, which converge posteriorly on the posterior dorsal region, from the nape of the neck to the level of the posterior part of the thighs. The scales on the flanks have the keel prolonged in a point, obliquely directed from below. Tail rather long, depressed at the base, but rounded for the rest of its length, covered with high-keeled scales, one-fourth larger than the dorsal ones, forming transverse rows throughout nearly the entire length. Legs short, covered with scales resembling those on the upper part of the trunk, but a little smaller. Length of tibia scarcely greater than that of the upper surface of the head. Scales of the chest and belly one-third larger than the dorsals, not showing any hollowing out on their free borders. Femoral pores large, from thirteen to fifteen under each thigh. In the males there are two large concave scales behind the anus, generally separated from each other by two scutella.

Measurements.—Total length of the largest specimen, 190 mm.; length of head from the end of the muzzle to the posterior border of the occipital plate, 15.5 mm.; width of head through the temples, 17 mm.; length of trunk from chin to anus, 80 mm.; length of tail, 110 mm.; length of tibia, 17 mm.

Color of upper part of body burnt umber, varied with olive, with a black spot in front of the arm and a brown scapular collar bordered on its front edge with yellow. On the middle dorsal region there is a double series of small, dark spots very close together; irregular black spots on the sides form oblique lines extending from the front over the flanks; brown bands cross the legs and tail. The males have the throat blue, with dark lines directed obliquely inward. The sides of the abdomen are also blue, and this color patch is bordered on the inner side with black from the armpit to the groin, from which point the same tint extends over the under side of the thighs. Breast yellow, spotted with gray; median abdominal region yellowish white, as is also the rest of the under side. The females resemble the males in respect to the superior regions, but have their under parts yellow and the throat rayed with blue.

Sceloporus dugesii resembles, at first sight, two distinct species—*Sceloporus torquatus*, characterized by very large dorsal scales, and *Sceloporus grammicus*, with the same scales relatively small. But this resemblance is only apparent and is due to a similarity of coloration

and to the scapular collar found on all three species. *Sceloporus dugesii* is distinguished by the characters given above and principally by the small dorsal scales, which are wide, obtuse, without serrations, and with the keel not terminating in a point. It is most nearly allied to the *Sceloporus ornatus* Baird, with which it agrees in the form of the scales and in the coloration, but the scales in the former appear to be smaller and the blue of the belly lacks the broad black border.

Sceloporus dugesii Bocourt.

Catalogue No.	Number of specimens.	Locality.	Donor.
9886	1	Borders of States of Guanajuato and Michoacan, Mexico.	A. Dugès.
9893	1		
9904	1		
9905	1		

SCELOPORUS PYRRHOCEPHALUS Cope.

Sceloporus pyrrhocephalus COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 177; Proc. Am. Phil. Soc., XXII, 1885, p. 394.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 235.

Dorsal scales much larger than ventral, strongly keeled, unimucronate, in about twenty-five transverse oblique series from nape to crural region. Lateral scales larger than abdominal; of the latter, a portion only slightly emarginate. Scales from ear to shoulder squamous; those of ear fringe a little larger than those anterior to them. Tail much compressed. Femoral pores twelve. Supraorbitals five, transverse, in immediate contact with narrow marginals, not touching superciliaries. Fronto parietal narrow; frontal broader than long, not divided. Parietals exceedingly small; interparietal large, much broader than long. Frontonasals, two each side, broader than long; posterior in contact; anterior embracing broad hexagonal internasal. Infralabials small, except the anterior pair, which are large and extensively in contact. From end of muzzle to ear, 12.5 mm.; ear to vent, 19 mm.; length of anterior limb, 12.5 mm.; of hinder limb, 23 mm.; of hinder foot, 14.5 mm.

Greenish brown, with a broad black band from the scapular region to the groin, light bordered above. Below yellowish, sides bluish ash to near the median line, on each side of which is a series of from seven to nine transverse blue bars. Upper labial and gular region striped with a series of black or bluish lines, which converge posteriorly on a paler or deeper yellow ground. Top of the head bright chestnut-red; the fontanelle white or pink, surrounded by a pale area. In females the head is brown above, except the parietal spot; the lateral stripe is obsolete, and the blue marks of the sides of the abdomen are replaced by brown.

This handsomely marked species is one of those which inhabits both the Tierra Caliente and the plateau of the western part of Mexico. It

was obtained in large numbers at Colima by Xantus, and was sent later from Guadalajara by Major. Its range in latitude does not appear to be extensive, as Günther does not report it from Guerrero, nor Boulenger from Jalisco. Dugès gives Michoacan as a habitat.

Sceloporus pyrrhocephalus Cope.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
41	Colima, Mexico	John Xantus	Alcoholic.
7	Guadalajara, Mexico.....	J. J. Major	do.

SCELOPORUS ORNATUS Baird.

Sceloporus ornatus BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 254.—COPE, Proc. Amer. Phil. Soc., XXII, 1885, p. 396.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 224.

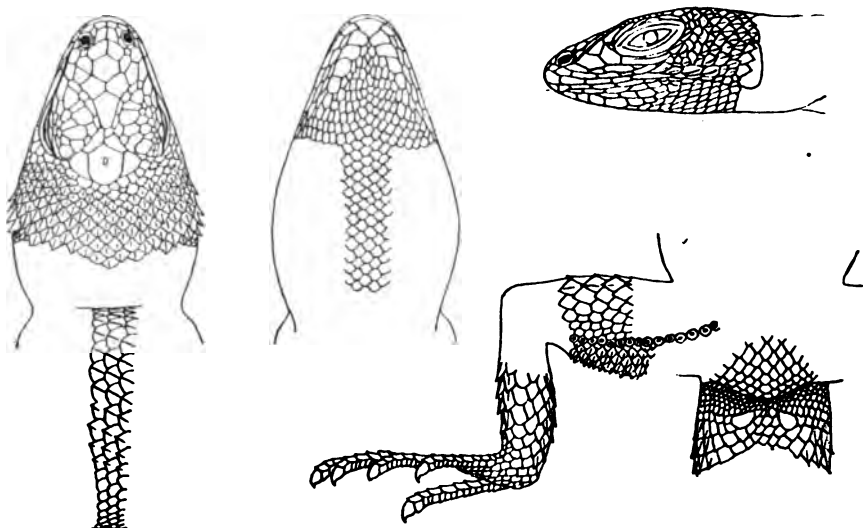


Fig. 48.

SCELOPORUS ORNATUS BAIRD.

× $\frac{1}{2}$.

Coahuila.

Cat. No. 2846, U.S.N.M.

Supraorbitals as in *S. torquatus poinsettii*, except that the inner crescent of large plates embraces that exterior to it in its convexity. Only one median cephalic plate, but a second probably suppressed. The portion of hind toe about five-sevenths the cephalic plates. Scales small; dorsal scales narrow; the outlines rounded, though rhomboidal; distinctly carinated, but without free spine or lateral denticulations; lower scales scarcely emarginated. Dorsal scales equal to those on the rump, which are abruptly much smaller than those on the tail; not

larger than those on the sides. About sixty-four series from head to tail, or about forty-six from cervical fold; femoral pores about twelve.

Color above dark green, becoming nearly black on the middle of back. A conspicuous nuchal black collar, margined before and behind, and banded transversely above with yellowish green; back spotted with the same; head angular, rather pointed, but rounded at the end. The first median plate suppressed, the second very large. Four rows of plates on the supraorbital region; cephalic plates smooth; scales on the body quite small, there being at least sixty around the middle of the body. A few only of the lower scales are notched. The under surface of tibia and post anal region are smooth. The hind feet are short, the free portion of length not reaching from snout to beginning of occipital plate. The tail is much thickened, decidedly wider behind the anus than at its root.

There is a broad black collar, which, beginning on and in front of the shoulders, crosses the nape, where it is ten scales long. It is bordered before and behind by yellowish green (the posterior band crossing the shoulders) and crossed centrally above by a transverse bar of the same. From this collar to above the anus, along the middle of the back, are eight or ten indistinct transverse dotted bars of light yellowish green, with smaller and more irregular ones on the sides. The under parts are greenish white; the head beneath and the sides of belly blue.

This species, with the general appearance of *S. torquatus*, is readily distinguished by the much smaller scales, without denticulation above. Of these there are more than 60 oblique rows from head to tail, instead of only about 40.

It differs from *S. formosus* in the smaller scales, and the presence of light margins to the cervical collar and of light spots on the back.

Sceloporus ornatus Baird.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2845	1	Patos Coahuila, Mexico.....	Lieut. B. Couch, U. S. A.....	Alcoholic.
9060	1	Redmond's Pass.....	J. H. Clark	do.

SCELOPORUS JARROVII Cope:

Sceloporus jarrovi COPE, Report Expl. Surv. W. of 100th Mer., G. M. Wheeler, Zoology, V, 1875, p. 569, pl. xxiii, figs. 2, 2b, 2c.—COPE, Proc. Amer. Phil. Soc., XXII, 1885, p. 396.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 223.

Scales of moderate size, gradually increasing in size from the ventral to the dorsal region, very weakly keeled, and not mucronate above, entire below, except on the pectoral and gular regions, where they bear an apical notch. Thirty transverse series between the interscapular and middle sacral regions. Scales of the superior faces of the limbs keeled. The large transverse supraorbital shields separated from the

frontals by one and from the superciliaries by two series of scales. Six internasals, five prefrontals, two frontals, and on each side posteriorly one frontoparietal and two parietals. Interparietal large; broad as long. Three longitudinal rows of superior labials; one triangular loreal. Temporals small, keeled; two very large auriculars. Two series of infralabials, the inferior ones short, transverse. Fifteen femoral pores. A short deep sinus on the side of the neck descending forward. The heel extends to a little beyond the elbow and the fingers to the groin.

Measurements.—Total length, 177 mm.; length to vent, 89 mm.; length to posterior border of meatus auditorius, 15.5 mm.; width of head at border of meatus auditorius, 14 mm.; width of head at nostril, $2\frac{1}{2}$ mm.;

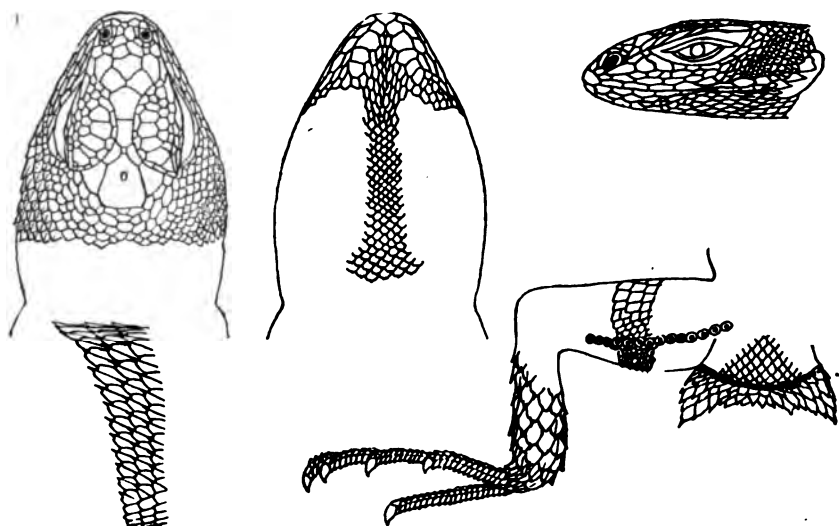


Fig. 49.

SCELOPORUS JARROVII COPE.

× $\frac{1}{2}$.

Arizona.

Cat. No. 8611, U.S.N.M.

width of frontal bone, $3\frac{1}{4}$ mm.; length of hind limb, $51\frac{3}{4}$ mm.; length of hind foot, $21\frac{1}{2}$ mm.; length of fore limb, 39 mm.; length of fore foot, 14 mm.

The ground color above is a bluish black, which becomes more distinctly blue on the limbs and sides, extending in a patch over the gular region and along the sides of the abdomen. The chin, middle of abdomen, and tail on median line below, shade from a bluish green in front to a yellow on the last region.

Each scale of the upper surface of the body is marked by a light spot, which was some brilliant shade, probably yellow, during life. Behind the interscapular region and on the tail they are light blue; top of head and neck bluish black, the latter inclosed in a rectangular area,

bounded by a light band from each squamosal region. Sides of neck with a broad black collar, bluish black; the collar with a light posterior border above; the dark color extending over the shoulder, the sides of the head, and the throat. A light band above the upper labials and a parallel one below the inferior labials.

A very handsome species, allied to the *S. torquatus*, *S. ornatus*, etc., resembling in a slight degree *S. formosus*, but is quite distinct, as the following diagnosis will show.

The distinctive characters of these species are as follows:

S. jarrovi.—Parietals 2; scales in vertebral line from occiput to opposite groin, 39. Dorsal scales all with yellow centers; two light bands on side of neck, the upper from the eye and continuous with the anterior border of the collar, the lower commencing at the muzzle; nape black.

S. ornatus.—Parietal single; scales to opposite groin, 50; above black, with two or more longitudinal rows of irregular light spots; no bands on side of neck; nape spotted.

Dedicated to Dr. H. C. Yarrow, the surgeon and zoölogist of the expedition for "Explorations West of the One-hundredth Meridian."

This handsome species has been found so far only in Arizona.

Sceloporus jarrovi Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8495	1	Arizona	—, 1873	H. W. Henshaw	Alcoholic.
8494	2	Camp Apache, Arizona	July —, 1873	do.....	do.
10194	1	White River Canyon, Arizona	—, 1879	Dr. R. T. Burr	do.
11863	2	Camp Rucker, Arizona .....	.....	.....do.....	do.
21115-7	3	Fort Huachuca, Arizona .....	.....	Dr. Wilcox, U. S. A.	do.
15756	1	Huachuca Mountains, Arizona .....	.....	L. Stejneger	do.
15757-9	3	Fort Huachuca, Arizona .....	.....	.....do.....	do.
22228-31	4	do.....	.....	A. K. Fisher	do.
17252	1	Nogales .....	.....	P. L. Jouy	do.

SCELOPORUS TORQUATUS Greene and Peale.

Sceloporus torquatus GREENE and PEALE, Journ. Acad. Nat. Sci., Phila., VI, 1827; 1828, p. 231.—COPE, Proc. Amer. Phil. Soc., XXII, 1885, p. 401.—BOULENGER (part), Cat. Liz. Brit. Mus., II, 1885, p. 219.—BOCOURT, Miss. Sci. au Mex., Pt. 3, 1874, p. 171, pl. XVIII, fig. 9.

Sceloporus torquatus WIEGMANN, Isis, 1828, p. 369; Herpt. Mex., Pt. 1, 1834, p. 49, pl. VII, fig. 1.—FITZINGER, Syst. Rept., 1843, p. 75.

Tropidurus (Sceloporus) torquatus WIEGMANN, Wagler Syst. Amph., 1830, p. 146.

Tropidolepis torquatus GRAY, Synops. in Griffith's Anim. Kingd., IX, 1831, p. 43.—DUMÉRIL and BIBRON, Erp. Gén., IV, 1837, p. 301.—GRAY, Cat. Spec. Liz., 1845, p. 208.—AUG. DUMÉRIL, Cat. Méth. Coll. Rept., 1851, p. 77.

Sceloporus poinsettii BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 126; U. S. Mex. Bound. Surv., 1859, p. 5, pl. XXIX, figs. 1-3.

Two external and one complete internal row of small supraorbitals, with one large central row of four or five, the two or three median ones divided transversely into two each. Three median cephalic plates. Four postnasals and four internasals. Free portion of longest toe

four-fifths the length of cephalic plates. Scales on back very large, broader than long, all distinctly carinate semicircular or subrhomboidal behind, with a free spine and three or four lateral denticulations. Lower ones distinctly notched. Those on inside of tibia smooth. Scales on middle of back decidedly larger than those on rump, but smaller than those on tail; not conspicuously larger than those on sides. About forty oblique series from head to tail, or twenty-seven from the series intersecting the lateral gular fold. Femoral pores about sixteen.

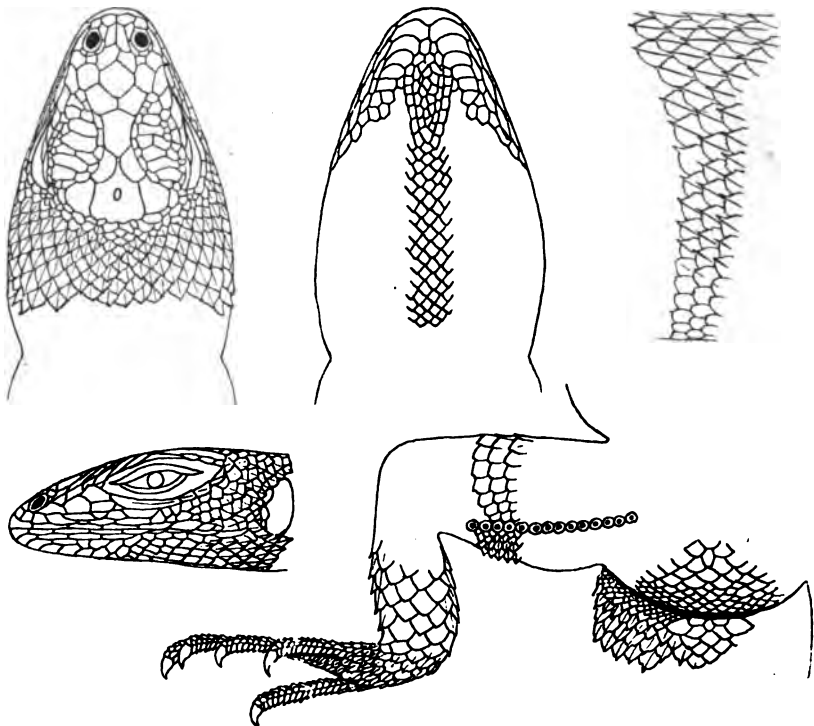


Fig. 50.

SCELOPORUS TORQUATUS PEALE AND GREENE.

× $\frac{1}{2}$.

Cat. No. 7122, U.S.N.M.

Color dark green above, with a neutral black collar bordered before and behind by light yellowish green, this anteriorly interrupted by black. Middle of back and nape spotted with light greenish. Beneath yellowish. Male with chin and sides of belly blue.

The most difficult problems to settle in the genus *Sceloporus* are the limits of the species *S. torquatus* and *S. undulatus*. With considerable material and the experience of Mr. Bocourt before me, I do not feel that I can make more than a contribution to the question as regards the *S. torquatus*. The collection of individuals I include under that name

embraces some with one row of large supraocular plates, and some with two; some with mucronate, and others with entire dorsal scales in numbers varying from twenty-five to thirty-five between occiput and groin; specimens with the anterior collar border divided and those where it is entire, and those with blue and those with gray throat and chin. In the following synopsis of varieties I indicate the localities where they are derived.

I. One row of large supraocular scales.

Dorsal scales not mucronate; collar border not interrupted.

(From Jalapa.)

S. t. torquatus.

II. Two rows of large supraocular plates.

Dorsal scales not mucronate; collar border not interrupted; nowhere blue.

S. t. poinsettii.

(Four from S. W. Texas, *Cope*, and two from uncertain Mexican localities.)

Dorsal scales not mucronate; collar with anterior border divided; back dark spotted, sometimes with light borders; chin, throat, and sides blue.

S. t. cyanogenys.

(Seven from Monterey, Nuevo Leon, *Cope*.)

Dorsal scales strongly mucronate; anterior collar border divided, and forming two yellow spots on nape; sides blue; chin and throat not blue.

S. t. mucronatus.

(Four from Vera Cruz, *Sartorius*.)

Dorsal scales strongly mucronate, a little smaller (eight equaling head); collar very slightly interrupted, borders very pale; green sides and narrow inferior collar blue; chin and throat not blue.....

S. t. formosus.

Four from Jalapa, *Montes de Oca*.

As in *S. t. cyanogenys*, but scales smaller; 8-10 in head; smaller.....

S. t. minor.

Two specimens from *Dugès*, ♀ locality.

Finally, the second form described under *S. melanogaster* may constitute another variety approaching the *S. t. torquatus*, but with the anterior collar border interrupted as in *S. t. cyanogenys*, and the back spotted as in *S. t. formosus*.

Should the interruption of the collar seen in the *S. serrifer* prove to be an inconstant character, that form must be regarded as subordinate to the *S. torquatus*, entering Section I, but related to the *S. t. mucronatus*. Should the anterior canthal scale appear in the *S. melanogaster*, nothing but color will distinguish it from the *S. t. torquatus*, but the strongly mucronate scales, and the very different color, which is, however, weakened in importance by the *S. t. cyanogenys* with its blue chin and throat.

The definition of the *S. t. torquatus* is taken from the type of Peale and Greene, which is, however, in the Museum of the Philadelphia Academy. It is correctly identified and figured by Bocourt.

Boulenger in the Catalogue of the Lizards in the British Museum regards the *S. t. formosus* as a distinct species, and the *S. melanogaster* and *S. ferraripezerezi* as varieties of the *S. torquatus*. He unites the var. *cyanogenys* with the var. *poinsettii*.

The *S. t. poinsettii* is the only form which has been found within the limits of the United States. The *S. t. cyanogenys* is found so near to

our boundary that it is not unlikely to be found within our limits. Indeed, I am not sure that I did not see this animal on the rocky banks of the Rio Grande at Laredo, Texas, in 1885.

SCELOPORUS TORQUATUS POINSETTII Baird and Girard.

Sceloporus torquatus poinsettii COPE, Proc. Amer. Phil. Soc., XXII, 1885, p. 402.—

BOULENGER, Cat. Iiz. Brit. Mus., II, 1885, p. 220.

? *Sceloporus torquatus*, var. B. WIEGMANN, Herp. Mex., 1834, p. 50.

Sceloporus poinsettii BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, August, 1852, p. 126 (San Pedro de Texas and Sonora, type); U. S. Mex. Bound. Surv., 1859, Rept., p. 5, pl. XXIX, figs. 1-3.—BOCOURT, Miss. Sci. Mexique, III, Rept., p. 171, pl. XVII, figs. 9, 9a, 9b, 9c.—COPE, Bull. U. S. Nat. Mus., No. 17, 1880, p. 17.

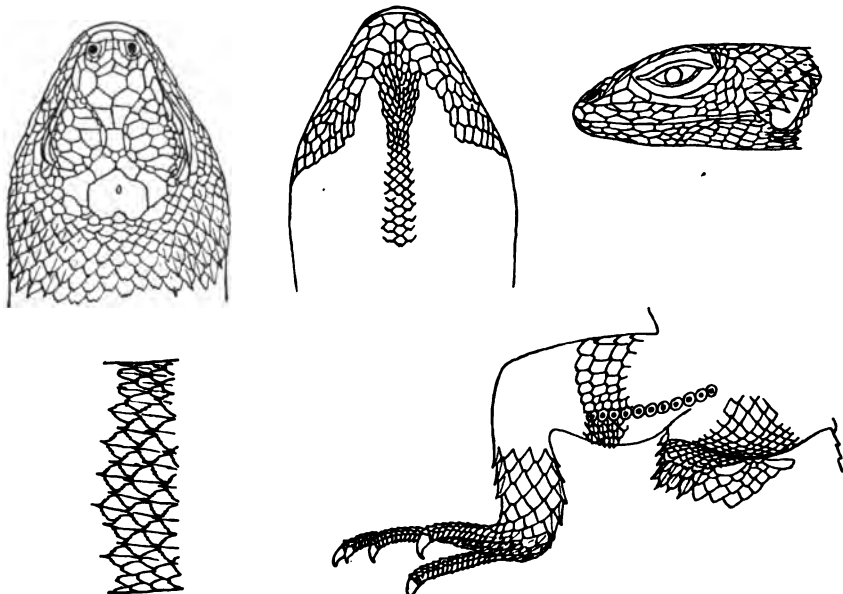


FIG. 51.

SCELOPORUS TORQUATUS POINSETTII BAIRD AND GIRARD.

× 8.

TEXAS.

Cat. No. 9990, U.S.N.M.

Sceloporus poinsettii.—A very large occipital, the encircling plates small, and the middle cephalic plates generally not regular. Supraorbitals and anterior cephalic plates as in *S. torquatus* (the former in five series). Free portion of hind toe scarcely three-fifths the length of cephalic plates. Scale on back very broad, semicircular; along the middle very obsoletely carinated, and all without spine, but denticulated freely, as are the inferior scales. The more lateral dorsal scales more distinctly carinate and spinous. Dorsal scales a little larger than those on rump, but scarcely narrower than the caudal. Inferior tibial scales smooth. Thirty-two oblique rows of scales from head to tail,

of which about twenty-two are from the cervical fold. Femoral pores, eleven.

Above yellowish green, with a well-marked neutral black collar, margined before and behind by yellowish. Back with transverse bars of dusky, forming distinct half rings on the tail.

Body stout, thickened; much depressed. Head scarcely wider than the neck. Tail cylindrical, except at the base, where it is much depressed; its under surface flattened; its length about $1\frac{1}{2}$ times that of head and body. Occipital plate large, nearly square; its width equal to the distance between the outer borders of the nostrils. Supra-orbital plates rather irregular, in two series of large, bordered internally by one row and externally by one or two of smaller (making four or five), exclusive of those forming the extreme edge. Infraorbital series formed of five or six plates, of which the horizontal one is twice as large as that anterior to it.

Scales on the body very large, spinous and crestless. Those on the back are twice as wide as those on the belly; rather broader than long; subcircular or subhexagonal and very thin. These are smooth on the under surface, except beneath the feet, but decidedly carinated on the sides and above, most especially on the tail. Those along the middle of the back (ten or twelve) rows are either very obsoletely carinated (as in Cat. Nos. 2952, 2933) or not at all. All the scales on the upper surface of the back and tail are denticulated; a larger tooth or spine in the center, and usually two or three on each side. On the back the central spine is but little longer than the lateral, owing to the truncation of the scale; on the tail, however, it is much longer, the scale very acute. There are about fourteen quite distinct femoral pores.

There are about forty-eight rows of scales encircling the body at the thickest part. Of these about seventeen are on the back, as nearly as can be estimated. At a distance from the anus equal to that from the nose to the hinder edge of occipital plate the tail is encircled by thirteen rows of scales.

In alcohol the color of this species is yellowish, with about seven transverse, broad, dusky bands above from head to opposite anus and as many thence to tip of tail. There are also traces of two or three on top of head; of these the one which extends between the shoulders is very distinct, crescentic in shape, and continuously black. The others are only faintly indicated by dusky sides to the scales. In the male the chin or space beneath the head is blue, and there is an elongated blue patch on each flank, margined internally and behind by black, more extended in the groin. The two patches are separated on the belly by about ten scales; they are very indistinct anteriorly. The remaining under parts are plain yellow. A supposed female (Cat. No. 2952*b*) has a trace of blue on chin, but none on the flanks.

In a specimen (Cat. No. 2955) the black collar on the neck above is extended across the throat. The dark dorsal bands are confined to the

central region for a width of some six scales, where the scales are more continuously colored than in Cat. No. 2952. Some of these scales have a tinge of green. The black cervical collar above is margined before and behind by a lighter shade of the ground color; as in Cat. No. 2952, there is one dusky band on the nape. The scales on the supraorbital region are more broken up and tubercular; the occipital plate narrower. The blue or green of the sides has no black margin anteriorly or externally. It extends nearly to the axillæ.

In some specimens the chin is spotted with blackish. In many the scales on the chin and sides are yellowish, but when removed the subjacent skin is seen to be bluish.

In Cat. No. 2960 the ground color on the back is greenish, with an occasional yellowish scale; the blotches and cervical crescent, as described. The chin is greenish, with a longitudinal line of yellowish; the lateral region spotted with the same. There are obsolete bands of lighter on the back between the dusky portions.

This species is very similar to *S. torquatus* Wiegmann in general appearance and character, but differs in several appreciable points. The plates on top of head are much more irregular. Then there is no symmetrical lateral occipital, although there is a plate larger than the others adjacent to it. The second series of three plates is entirely broken up into irregular small ones; the more anterior ones are pretty much the same in both. The supraorbital plates are much more irregular and tubercular, the central ones smaller. There is no tangible difference in the infraorbital series. The plates on the temporal region, between the eye and ear, and those on the under surface of feet are considerably larger. The fingers and toes are shorter. The scales on the middle of the back are flatter, more membranaceous, more truncate behind, and much less connected—in fact, usually smooth.

The color differs in being yellowish above instead of green; the dorsal blotches and the large blue patch on the flank, are more distinct. The black collar is more crescentic or rounder behind than V-shaped, and lacks the distinct process separating the yellowish anterior margin. The light markings anterior to the collar and its margin are in the form of transverse bands, not spots.

The largest of its genus found in Texas, this species has nearly the range of the *S. spinosus*. I found it very abundant in the first plateau region as far as the upper waters of the Guadalupe. It differs in its habits from the *S. spinosus*, being exclusively a dweller in rocks. It may be seen at any time running over the limestone cliffs of the plateau region, to which its light colors present but little contrast. The relation between its color and habitat is quite as striking as in the *S. spinosus*.

Sceloporus torquatus poinsettii.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2952	2	Sonora.....		Colonel Graham.....	Alcoholic.
2956	2	Santa Caterina.....	Apr. —, 1855	Lieutenant Couch.....	do.
2933	1	Plains of Chihuahua.....		John Potts.....	do.
2955	1	Limpia Mountains, Texas.....		Major Emory.....	do.
2960	1	Live Oak Creek, Texas.....	Nov. —, 1854	do.....	do.
2947	1	Santa Rita del Cobra.....		Dr. Webb.....	do.
2946	1			R. H. Kirt, esq.....	do.
2956	1	Texas.....		Captain Pope.....	do.
2958	3	Ojo Caliente, Chihuahua, 30° on Rio Grande.....		Dr. Webb.....	do.
2948	3	San Pedro.....		Colonel Graham.....	do.
2920	2	Between Los Nogales and Rio Grande.....		Major Emory.....	do.
8493	1	Camp Apache, Arizona.....	— —, 1874	Dr. C. G. Newberry.....	do.
8150	1	Arizona.....	— —, 1871		do.
9378	1				do.
9379	1				do.
9380	1				do.
8610	1	Santa Rita Mission.....	— —, 1874	Expt. W. of 100th M.....	do.
2958	1	Ojo Caliente.....		Dr. Thos. Webb.....	do.
2920	1	Los Nogales.....		Dr. C. B. R. Kennerly.....	do.
15461	1	San Diego, Texas.....		W. J. Taylor.....	
19687-9	3	Fort Huachuca, Arizona.....		Dr. T. Wilcox.....	

SCELOPORUS TORQUATUS MINOR Cope.

Sceloporus torquatus minor COPE, Proc. Amer. Phil. Soc., 1885, XXII, p. 402.

Two rows of large supraocular plates. Dorsal scales not mucronate; collar with anterior border divided; back dark spotted, sometimes with light borders; chin, throat, and sides blue. Scales smaller; 8-10 in head. Size smaller.

This small form inhabits, so far as is known, only the plateau region of Mexico.

Sceloporus torquatus minor Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.
17656-9	4	Santa Ynez mine, Charcas, Mexico.....	P. L. Jouy.

Two specimens of this form were sent me by my friend Dr. A. Dugès, which came from Zacatecas, Mexico.

SCELOPORUS HORRIDUS Wiegmann.

Sceloporus horridus WIEGMANN, Herpetologia Mexicana, 1834, p. 50.—BOCOURT, Miss. Sci., Mex. Rept., 1874, p. 178, pl. XVIII, fig. 8.—COPE, Proc. Am. Phil. Soc., 1885, XXII, p. 394.

Tropidolepis horridus DUMÉRIL and BIBRON, Erp. Gén., IV, p. 306.—GRAY, Cat. Liz. Brit. Mus., p. 209.

Sceloporus spinosus var. *horridus* BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 227.

Sceloporus oligoporus COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 177.

Dorsal scales large, mucronate in twenty rows, from interscapular to sacral regions, larger than laterals, which are larger than ventrals; last with a sharp mucro and one or two emarginations. Tail cylindri-

cal; femoral pores only two or three. Parietals large; interparietal longer than broad. Frontal and frontoparietal broad; former longer, undivided. Divided frontonasals and internasals in contact; supra-orbitals in contact with both marginals and superciliary ridge, four on each side. Three pairs infralabials, transverse, the anterior barely in contact. Three bordering scales of ear, not larger than those preceding. End of muzzle to ear, 23 mm.; ear to vent, 86 mm.; length of tail, 75 mm.; length of anterior extremity, 17 mm.; posterior, 14.7 mm.; hind foot, 25 mm. Males, above brown, with a yellowish dorsolateral band and seven or eight pairs of yellowish, anteriorly black-edged spots on the back. Top of head red, below whitish, sides faintly blue tinged. Females brown-olive, with a paler dorsolateral band. Throat, a broad band to shoulders and sides of abdomen blue.

This species is especially characterized by the small number of its femoral pores. It differs further from the *S. spinosus* and agrees with the species of the *S. clarkii* group in the absence of small scales between the supraoculars and frontoparietals.

Sceloporus horridus Wiegmann.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1179	2	Colima, Mexico	Jno. Xantus	Alcoholic.
1200	12	do	do	do.
1220	1	do	do	do.
1280	1	do	do	do.
1299	1	do	do	do.
1315	1	do	do	do.
1377	6	do	do	do.
1407	1	do	do	do.
	3	Guadalajara	J. J. Major	do.

Although this species abounds in the tierra caliente of the west coast at Colima, it inhabits also the plateau of Jalisco.

SCELOPORUS ORCUTTII Stejneger.

Sceloporus orcuttii STEJNEGER, North American Fauna, No. 7, 1893; p. 181, pl. 1, fig. 4.

Dorsal and lateral scales large, subequal; ventral scales a little smaller. Femoral pores, 13-15. Head scales smooth; frontal not longitudinally divided; two parietals on each side.

Scales rounded, not keeled, the border serrate with a moderately prominent, flat median point. Caudal scales with longer and recurved points. Scales of inferior surfaces notched; those of the limbs above keeled and mucronate, below little notched or entire. Dorsal scales in parallel rows; of sides oblique upward and backward. Two scales on the canthus rostralis. One row of transverse scales above the orbit, which are separated from the frontals forward by one row of small scales, but are in contact with the frontoparietals and parietals. Two parietals; the anterior rhomboidal, the posterior transverse.

Seven dorsal scales in a head length, and twelve ventrals. Eighteen scales between groin and humerus, and nine scales from above middle of humerus to interparietal plate. Four superior labial plates, the last very narrow, and separated from the orbit by two rows of scales and a narrow suborbital plate. A series of long, mucronate, chaffy scales in front of the auricular meatus, which is followed by large chaffy scales, of which the posterior row overhangs a pocket which is lined with granular scales. Limbs and digits rather short and robust, the longest toe of the oppressed hind limb reaching the front of the auricular meatus.

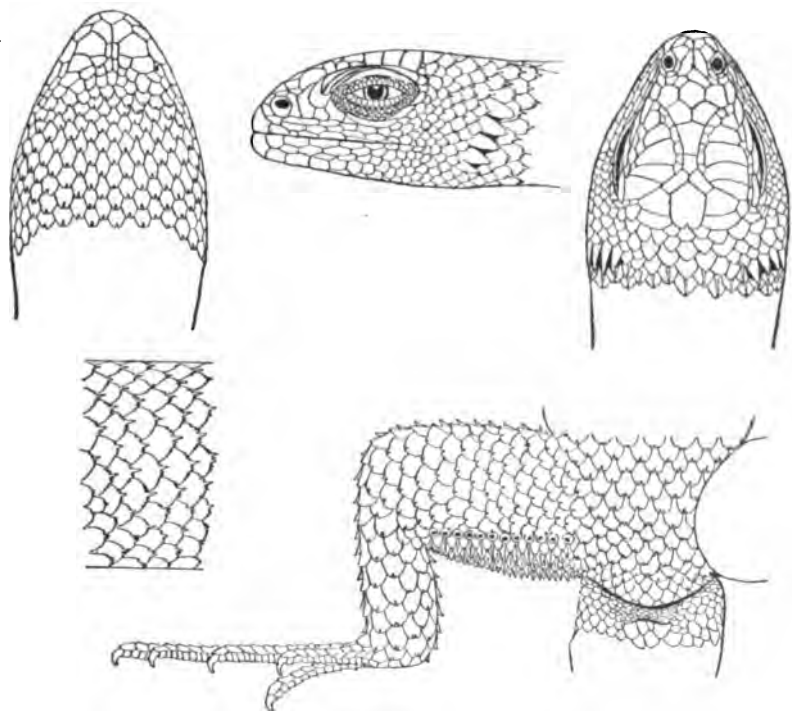


Fig. 52.

SCELOPORUS ORCUTTI STEJNEGER.

× 1.

Southern California.

Cat. No. 91922, U.S.N.M.

Measurements (Cat. No. 21922).—Total length, 225 mm.; length to vent, 95 mm.; length to axilla (axial), 38 mm.; length to auricular meatus (axial), 15 mm.; width of head at auricular meatus, 21 mm.; length of fore limb, 41 mm.; length of fore foot, 19 mm.; length of hind limb, 63 mm.; length of hind foot, 30 mm.

The coloration of this species is peculiar and striking. The ground on the middle dorsal region is brown, and on the sides blackish. In smaller specimens there are transverse rows of whitish scales which

give a cross-banded result; the tail is blackish, and the inferior surfaces are light bluish. In adults the colors are more brilliant. The median dorsal scales have a blue spot at the base and a reddish spot at each margin. On the laterals three or four spots are present, but they may be blue, green, or reddish, giving on some scales an ocellated effect, the whole being quite kaleidoscopic. The head, limbs, and tail are dark blue, as are all the inferior surfaces excepting an obscure paler space connecting the axillæ.

This species is nearly related to the *S. clarkii* Baird and Girard, but differs in the presence of two parietal plates on each side, in the absence of keels on the scales, and in the coloration. The posterior parietal plates articulate with the interparietal, and are not entirely posterior, as represented in Dr. Stejneger's otherwise excellent figures. The character of the coloration is very handsome in adults and is unique in the genus.

In its geographical range the *S. orcuttii* is restricted to southwest California in the mountainous region near the coast. It is named for Mr. C. R. Orcutt, a well-known naturalist of San Diego.

Sceloporus orcuttii Stejneger.

U.S. N.M. No.	Number of speci- mens.	Locality.	When col- lected.	From whom received.
16330	10	Milquatay Valley, San Diego County, California.	Jan. 5, 1890...	Chas. R. Orcutt.
16522		San Diego County, California.	.....	do.
20214-29		Witch Creek, Santa Ysabel, San Diego County, California.	.....	H. W. Henshaw.
20345-49		do	.....	do.
20386-90		do	.....	do.
21165		San Jacinto, California.	.....	Chas. H. Gilbert.
21918-19		Mountain Spring, east slope Coast Range, San Diego County, California.	.....	Dr. E. A. Mearns
21920		Summit Coast Range, San Diego County, California.	.....	do.
21921-27		Jacumba Hot Spring, San Diego County, California.	.....	do.
21928-29		Nochogueno Valley, near United States border, Lower California.	.....	do.
21930		Mountain Spring, San Diego County, California.	.....	do.

SCELOPORUS ZOSTEROMUS Cope.

Sceloporus zosteromus COPE, Proc. Acad. Nat. Sci. Phila., 1863, p. 105; Proc. Amer. Phil. Soc., XXII, 1885, p. 395.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 225.—VAN DENBURGH, Proc. Cal. Acad. Sci., V, 1895, p. 108—STEJNEGER, North Amer. Fauna, No. 7, 1893, p. 178, pl. 1, fig. 3.

Sceloporus clarkii zosteromus COPE, Check List Batr. Rept. N. Amer., 1875, p. 49.

Sceloporus rufidorsum YARROW, Proc. U. S. Nat. Mus., V, 1882, p. 442.

Scales large, strongly keeled, slightly denticulate, in ten longitudinal rows on rump and nape, and eighteen to twenty transverse between those points; six in a head length. Lateral scales larger than abdominal, not granular above and before shoulder. Auricular scales much longer than those adjacent. Cephalic shields smooth; prefrontal longer than broad, single; supraoculars in one series, transverse, posteriorly

in immediate contact with superciliary series. Abdominal scales emarginate, accumulated on the posterior gular region, where many are tricuspid. Hind limb extended, reaching orbit. Femoral pores 17-18.

Length from muzzle to vent, 240 mm.; from muzzle to axilla, 106 mm.; hind foot, 75 mm. Male, above bright olivaceous, with a reddish longitudinal dorsolateral band on each side, crossed medially by numerous indistinct brown bars; often obsolete; under surface and sides of tail yellowish. Anterior face of femur, groin, a large spot anterior to brachium, a broad band connecting the latter with the former, and the latter of each side, across posterior gular region, black, which shades

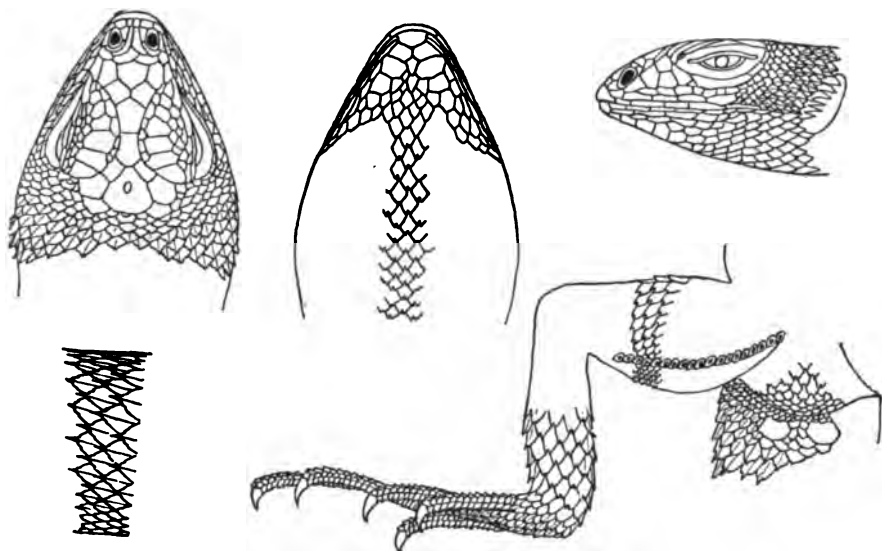


Fig. 53.

SCELOPORUS ZOSTEROMUS COPE.

× 7.

Lower California.

Cat. No. 125419, U.S.N.M.

into blue on sides and throat. Chin light green. Brachium black in front. In younger specimens the prebrachial spot often does not connect with the lateral abdominal band.

A large species to be compared with the *S. clarkii*, which is found in Texas and Arizona. The latter has a shorter prefrontal plate, greater size, and different coloration.

In two specimens received since the above description was written (Cat. No. 11971) the entire inferior surfaces, excepting the chin, gular region, tail, tibiae, and feet, are bluish black.

Mr. Van Denburgh¹ reports this species from various localities in the

¹ Proceedings, California Academy of Sciences, V, 1895, p. 108.

Lower California peninsula; as San José Island, San Pablo, Santa Margarita Island, Miraflores, Magdalena Island, and San José del Cabo.

Sceloporus zosteromus Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
5298	12	Cape St. Lucas, Lower California.	.....	J. Xantus	Alcoholic.
12649	21	La Paz, Lower California.	— —, 1882	L. Belding	do.
12650	1	do	— —, 1882	do	do.
12667	5	do	— —, 1882	do	do.
11971	2	do	— —, 1882	do	do.
11981	1	do	— —, 1882	do	do.
15893	1	Cape St. Lucas, Lower California.	.....	U. S. Fish Commission.	do.

SCELOPORUS CLARKII Baird and Girard.

Sceloporus clarkii BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, August, 1852, p. 127; Sonora.

Sceloporus magister HALLOWELL, Proc. Acad. Nat. Sci. Phila., VII, June, 1854, p. 93; Fort Yuma.—STEJNEGER, North Amer. Fauna, No. 7, 1893, p. 178, pl. 1, fig. 2.

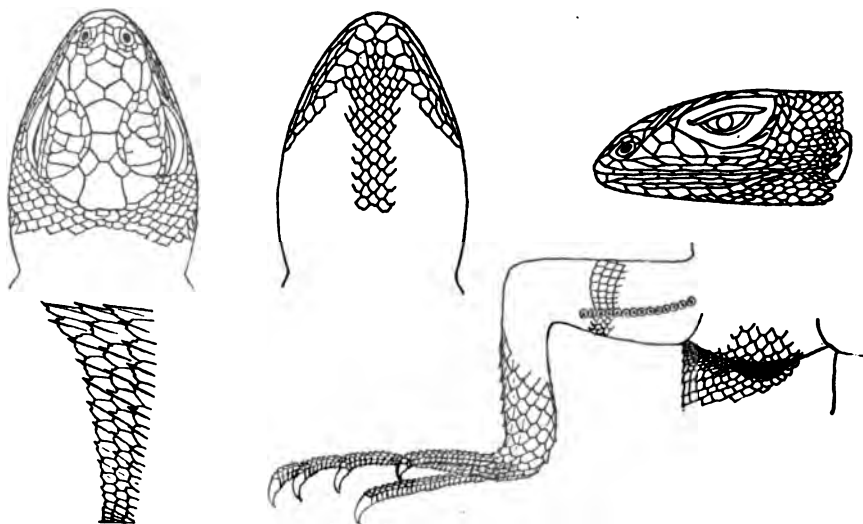


Fig. 54.

SCELOPORUS CLARKII BAIRD AND GIRARD.

× 2.

Arizona.

Cat. No. 8489, U.S.N.M.

Cephalic plates very large and regular; only one series of five large, transverse, supraorbital plates, bordered internally and externally by very small ones, the internal border wanting behind. Lateral occipitals nearly as large as middle cephalic plates; otherwise much as in

S. torquatus, except that there are two single verticals. Free portion of longest toe nearly equal to the cephalic plates, reaching from muzzle to middle of occipital. Scales on back strongly carinated and acutely pointed, with a conspicuous, but not entirely free, spine. Two or three distinct lateral denticulations. Belly scales notched. No conspicuous difference in size between scales of back, rump, and tail above; the first, however, larger than those on sides. Scales smooth on the inside of tibia. About thirty-two oblique rows of scales from head to tail, twenty-two from cervical fold. Femoral pores, fourteen or fifteen.

Color, yellowish green, with a distinct, cervical, black collar, broadly interrupted above and continued below across the throat; not margined. Back with dull, obscure, transverse bars and a series of dusky spots beneath a rather lighter lateral line.

In this species the head is scarcely wider than the neck. The wide space between the true marginal series of plates is occupied by one series of five, broad, short plates. Of these, the two posterior are in immediate contact with the occipitals; the others cut off from the median ones. The other plates which occupy the remaining portion of the head are arranged as follows: Beginning with the posterior, or occipitals, 3, 2, 1, 1, 2, 3, and perhaps 2, 2 smaller ones, to the nostrils, although this space is sometimes much broken up. The occipitals are large; the two of the second row are separated by the contact of the middle one of first row and the third; the two of the fifth row likewise separated by the contact of fourth and middle fifth. The infraorbital chain is composed chiefly of one large horizontal plate. The temporal scales are large, about six series intervening between the orbital chain and the ear.

All the upper and lateral scales, as well as those on the under surface of the feet, are strongly carinated; the carina extended into a conspicuous spinous point. Those on both upper and under surface herein, besides ending in a point, have the posterior edge denticulated on each side of this, seen even on the chin.

The general color of this species in the alcoholic specimen is a yellowish olive above, with a series of transverse but obsolete dusky bars, of which there are perhaps ten from the cervical collar to above the anus and continued to the tip of tail. These appear to be separated by rather lighter intervals and themselves to be almost broken up into about four blotches. There is a slight indication of a V-shaped blackish-green collar on the side of the neck, just against the shoulder; but this is interrupted on the back, the branches running out to a point. Below, it is continued across the throat as a dusky green band, and the sides of the chin being of the same color, they bound a triangular blue spot beneath the head. There is also a blue patch on each side the belly, extending from fore to hind legs and scarcely separated on the median line. It appears to be rather darker internally and behind.

A specimen (Cat. No. 2964) in better condition than the type (Cat. No.

2940a) differs mainly in having the cephalic plates of the first and third series and the fourth and sixth separated by second and fifth. The upper parts show the four series of blotches above, about seven from the collar to above anus. They are arranged in two series of rounded blackish spots close together along the back, occupying a breadth of some six scales; then an interval of two or three rows lighter than the ground color; then a lateral series of rounded blotches, or two or three rows. They are all quite obsolete, however. The black, interrupted half collar on the hinder part of the neck is indicated above by an obsolete, dusky band. The center only of the chin is blue, the space covered by blackish green in Cat. No. 2940a being here only greenish white. The ventral blue patches are only indicated behind, very slightly internally. The groin is much marked with blackish.

A specimen of this species sent me from San Bernardino, California, by my friend, Mr. J. S. Lippincott, has six brown cross-bands on the body, and a vertical prehumeral brown band which nearly meets the corresponding one on the other side. These bands are broadly yellow-bordered posteriorly, and are continued with the yellow borders as oblique bars on the sides to the belly. The individual is a female.

This species is readily distinguished from *S. torquatus* and *poinsettii* by the large plates in the supraocular region and other peculiarities about the head. The dark dorsal bars, instead of being continuous, are broken up into four blotches. The cervical collar is greatly interrupted above. The blue patch on the belly is much closer, the blue of chin is more restricted, and usually encircled by dusky greenish.

Dr. Stejneger regards¹ the *S. magister* of Hallowell as a species distinct from the *S. clarkii*. The only characters which he gives are the longer preauricular scales of the former and the presence of dusky cross-markings on the forearm and hand. He gives figures of the heads of the two supposed species, but the differences there shown do not, in my opinion, warrant the recognition of the *S. magister* as distinct. According to Jouy, who observed the species in life, the two forms are distinguishable by their colors, and they have different habitats, the one being found only on high ground, and being shy and agile, and the other living on low ground and climbing trees, and being sluggish and fearless. Stejneger believes these forms to have different distributions; thus, the *S. magister* inhabits the deserts of southern California, Nevada, and southwestern Utah, while the *S. clarkii* inhabits southeastern Arizona and an unknown distance into Mexico. They occur together near Tucson, Arizona. These forms do not seem to me to be worthy of distinction as subspecies.

¹North American Fauna, No. 7, 1893, p. 178.

Sceloporus clarkii.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2924	1	California			Alcoholic.
3203	1	Colorado River		Lieut. Ives	do.
2940	2	Sonora		Col. Graham	do.
2967	1	California		Williamson	do.
2897	1	Alamo de Parras		Lieut. Couch	do.
2890	1	Rio Pecos		Capt. Pope	do.
2964	1	El Paso and Janoz, Mexico		Maj. Emory	do.
2879	1	Jussou, St. Madelina		John Potts	do.
2965	7	Colorado River		Maj. Emory	do.
2949	2	Los Nogales, Sonora		Lieut. Ives	do.
2957	3	Colorado River		Maj. Emory	do.
4111	2	El Paso		Lieut. Ives	do.
8483	2	Rock Canyon, Arizona	July —, 1874	J. H. Rutter	do.
8487	1	Santa Rita Mountains, Arizona	Aug. 28, 1874	H. W. Henshaw	do.
8485	1	Camp Crittenden, Arizona	Sept. —, 1874	Expl. W. 100 M.	do.
8484	1	do	Aug. —, 1874	J. H. Rutter	do.
8488	1	Southeast Arizona	Oct. —, 1873	W. Summers	do.
8489	1	do		Expl. W. of 100 M.	do.
9400	2	Colorado River		Dr. C. G. Newberry	do.
2954	6	Matamoros, Mexico		Lieut. B. Couch, U. S. A.	do.
8663	1	Fort Craig, New Mexico	—, 1874	Dr. H. C. Yarrow	do.
8674	1	Southern California	—, 1875	H. W. Henshaw	do.
9518	1	Nevada	—, 1877	do.	do.
8672	1	Mohave Desert, Arizona	—, 1875	Dr. O. Loew	do.
11979	1	La Paz, L. California	Feb. —, 1882	L. Belding	do.
2965	6	Colorado Basin		A. Schott	do.
2967	1	Pacific R. R. Exp.		Lieut. R. S. Williamson, U. S. A.	do.
17782		Fort Huachuca, Arizona		Dr. T. E. Wilcox	do.
19684-6		do		do.	do.
21113-14		do		do.	do.
22218-27		do		Dr. A. K. Fisher	do.
15746-47		Calabasas, Arizona		L. Stejneger	do.
16962-3		Tucson, Arizona		P. L. Jouy	do.
17250-1		32 miles south of Nogales, Mexico.		do.	do.
16826		Tucson, Arizona		do.	do.
14773		Ash Creek, Arizona		Capt. W. L. Carpenter	do.
14815		Fort Verde, Arizona		Dr. E. A. Mearns	do.
15748		Tumacacori, Arizona		L. Stejneger	do.
16935		Tucson, Arizona		P. L. Jouy	do.
16961-3		do		do.	do.
17240-44		do		do.	do.
17245-49		Nogales, Arizona		do.	do.
19353-5		Mexican boundary line		Dr. E. A. Mearns	do.
19427		do		do.	do.
19473		do		do.	do.
19684-6		Fort Huachuca, Arizona		Dr. T. E. Wilcox	do.
20583		San Pedro River, Arizona		Dr. E. A. Mearns	do.
16937		Tucson, Arizona		P. L. Jouy	do.
21794		Tineja Alta, Yuma County, Arizona		Dr. E. A. Mearns	do.
21908-10		Fort Yuma, California		do.	do.
21911		Unlucky Lake, New River, San Diego County, California		do.	do.
21912		Laguna Station, New River, San Diego County, California		do.	do.
21913-15		Gardners Laguna, Salton River, Lower California		do.	do.
21916-17		Cooks Wells, Salton River		do.	do.
22382		Mesilla Valley, New Mexico		T. D. A. Cockerell	do.
16893		Parker, Colorado River Indian Agency, Arizona		G. A. Allen	do.
16964-6		Tucson, Arizona		P. L. Jouy	do.
17246-9		do		do.	do.
22269		Las Cruces, New Mexico		Dr. T. D. A. Cockerell	do.

"S. magister Hall."
Stejneger

Sceloporus clarkii—Continued.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	Date.	Collector.	Remarks.
			<i>Feet.</i>			
18096	Female...	Pahrnagat Valley, Nevada		May 23	Merriam...	
18097	Male....	do		do	do	
18098	Female...	do	4,100	do	do	
18099	Female...	do	do	do	Bailey	
18100	Female ¹ ...	do	do	do	Merriam	
18101	Male ¹ ...	do	do	May 25	Bailey	
18102	Female...	Pahrnagat Mountains, Nevada		May 26	Merriam	
18103	Male....	Pahrump Valley, Nevada	5,000	Apr. 29	do	Yucca belt.
18104	Male....	Callville, Nevada		May 4	Bailey	
18105	Male....	Ash Meadows, Nevada		Mar. 16	Nelson	
18106	Male ¹ ...	do		Mar. 20	Palmer	
18107	Male....	Vegas Valley, Nevada		May 1	Bailey	
18108	Male....	Indian Spring Valley, Nevada		May 29	Merriam	
18109	Male....	do		do	Bailey	
18110	Male ¹ ...	Grapevine Mountains, Nevada		June 8	Nelson	4,000 feet above Salt Wells, Mesquite Valley.
18111	Male ¹ ...	Bunkerville, Nevada		May 8	Merriam	
18112	Male....	St. George, Utah		May 12	Bailey	
18113	Male....	do		May 13	do	
18114	Male....	Diamond Valley, 10 miles north of St. George, Utah.	4,800	May 16	Merriam	Lava rock.
18115	Male....	do	4,800	May 16	do	Do.
18116	Male....	Panamint Mountains, Cottonwood Canyon, California.		June 14	Nelson	4,400 feet above Salt Wells.
18117	Male....	do	3,900	May 29	do	
18118	Male....	Panamint Mountains, Willow Creek, California.	3,800	May 23	do	
18119	Female ¹ ...	do	4,600	May 17	do	
18120	Female...	Walker Pass, California	4,000	July 2	Bailey	
18121	Female...	do	4,000	July 1	do	
18122	Female...	do	4,000	do	do	
18123	Male....	Mohave, Mohave Desert, California		June 28	Palmer	
18124	Male....	Near Mohave, Mohave Desert, California.		do	Merriam	
18125	Male....	do		do	do	
18126	Male....	do		Apr. 6	do	
18127	Male....	Mohave Desert, near base of Gran- ite Mountains, California.		Apr. 25	Bailey	On rocks.
18128	Female...	Argus Range, Shepherd Canyon, California.		Apr. 29	Fisher	
18129	Female...	do		Apr. 27	do	
18130	Female...	Argus Range, Searl's Garden, California.	3,000	Apr. 24	Stephens	
18131	Male....	Owens Valley (Lone Pine), Cali- fornia.		June 11	Fisher	
18132	Female ¹ ...	do		June 12	do	
18133	Male....	Columbus, Nevada		Dec. '90	Bailey	

¹ Young.

Dr. Merriam, in his report upon the results of the Death Valley expedition, gives the habits of this species as follows:

The large scaly lizard known as *Sceloporus clarkii* (*magister*) is a lower Sonoran species, ranging across the southern deserts and desert ranges of the Great Basin from California to Arizona and southwestern Utah. Unlike most of the lizards inhabiting the same region, it does not run about on the open desert, but lives on the tree yuccas, the ruins of stone, or adobe dwellings, the nests of wood rats, and other objects that afford it shelter and protection. At the mouth of Beaverdam Creek, in northwestern Arizona, it was common among cottonwood logs and dead leaves. In Pahrnagat Valley it was abundant about the ruins of stone houses and along the faces of cliffs. In the Mohave Desert and other localities it is common on the tree yuccas, where it was often found on the very summits of the highest branches, and where it was rather wary and difficult of capture without a gun.

In California it occurs throughout the Mohave Desert, ranging as far west as the tree yuccas in Antelope Valley and Walker Pass, and thence easterly in Owens Valley, Borax Flat, and the Argus and Panamint mountains.

In Nevada it was found on the Grapevine Mountains, in Ash Meadows, in Pahrump Valley, at the foot of the Charleston Mountains, in Vegas and Indian Springs

valleys, in Pahranaagat Mountains and Valley, at the Great Bend in the Colorado River, and in the valley of the Virgin.

In Arizona it was abundant at the point where Beaverdam Creek joins the Virgin.

In Utah it was common in the lower Santa Clara or St. George Valley.

Sceloporus clarkii (magister) is a mixed feeder, both insects and flowers being found in the stomach examined. At the Great Bend of the Colorado, Nevada, and at St. George, Utah, stomachs were opened that contained insects only. One from the latter locality contained a large goldsmith beetle.

Mr. J. Van Denburgh describes some *Scelopori* from Lower California as a distinct species under the name of *S. lickii*. The figures he gives represent a smaller form than the true *S. clarkii*, and one that is differently colored. Study of both the plates and description however fails to reveal any other character by which it differs from that species. I therefore for the present regard it as a local race. I append Mr. Van Denburgh's description:

The head is considerably depressed, with rounded snout. There are two scales on the canthus rostralis. The nostrils are large, almost superior, and nearer to the end of the snout than to the orbit. The ear opening is very large, almost vertical, and with a strong anterior denticulation of six pointed scales. The head shields are smooth and somewhat convex. The supraoculars are very broad. The superciliaries are very long, narrow, and strongly imbricate. There are two series of small, and one of large, sublabial plates, bordered below by the large, imbricate, bicuspid, gulars. There is a strong fold on each side of the neck. The dorsal scales are slightly smaller than the caudals, strongly keeled, very strongly mucronate, and with serrate edges. The lateral scales are similar to, but smaller than the dorsals, arranged in oblique series, and graduating into the dorsals and ventrals. The ventrals are much smaller than the dorsals, smooth, and bi- or tri-cuspid. The caudals are very strongly keeled and mucronate. The posterior surface of the thigh is covered with large, pointed, keeled scales. There are fifteen femoral pores. Male, with enlarged post-anal plates. There are thirty-three dorsal scales between the interparietal plate and the base of the tail.

The back and sides are olive brown, many of the scales having central markings of deep blue or green. A narrow line of verdigris green runs along each side from the eye to the base of the tail. Below this, a narrower similarly colored line runs from the ear to a point a short distance above and behind the axilla. A patch in front of the shoulder, the central part of the belly, and the anterior and lower surfaces of the thigh are black, which color gradually fades into the cyanine blue of the sides of the belly. The throat is olive gray with greenish-white lines which converge to a point midway between the neck pouches. The tail is brown suffused with campanula blue and beryl green toward its base.

Snout to vent, 74 mm.; fore limb, 37 mm.; tail, 105 mm.; shielded part of head, 15 mm.; hind limb, 54 mm.; base of fifth to end of fourth toe, 22 mm.

There is very little variation in color, either individual, sexual, or in accordance with age. One male from Miraflores has a single large blue patch on the throat, through which the ordinarily whitish lines show as lines of paler blue.

This species may be easily distinguished from *S. consobrinus* by its larger scales on the back of the thigh; from *S. biseriatus* by its larger scales on the border of the ear and the back of the thigh; from *S. orcuttii* by its smaller and much rougher dorsals; and from *S. magister* and *S. zosteromus* by its smaller and more sharply mucronate scales. It differs from all these in coloration.

Mr. Van Denburgh gives the following list of localities from which he obtained specimens of *S. lickii*: San José del Cabo, Lower California; Corral de Piedras, Sierra el Taste, Lower California; Miraflores, Lower California; Sierra San Lazaro, Lower California.

SCELOPORUS SPINOSUS Wiegmann.

- Sceloporus spinosus* WIEGMANN, Isis, 1828, p. 369; Herpt. Mex., Pt. 1, 1834, p. 50, pl. VII, fig. 3.—FITZINGER, Syst. Rept., 1843, p. 75.—BAIRD, U. S. Mex. Bound. Surv. Rept., 1859, p. 5, pl. XXIX, figs. 4-6.—BOCOURT, Miss. Sc. Mex., Rept. 1874, p. 174, pl. XVIII, fig. 2.—COPE, Proc. Am. Phil. Soc., XXII, 1885, p. 395.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 226.
- Tropidolepis spinosus* GRAY, Syn. Rept. Griff. An. King., IX, 1831, p. 43.—DUMÉRIL and BIBRON, Erp. Gén., IV, 1837, p. 304.—GRAY, Cat. Spec. Liz., 1845, p. 209.—AUG. DUMÉRIL, Cat. Coll. Rept., 1851, p. 77.
- Tropidurus spinosus* WAGLER, Syst. Amph., 1830, p. 146.
- Sceloporus floridanus* BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 254.—STEJNEGER, North American Fauna, No. 7, 1893, p. 181.

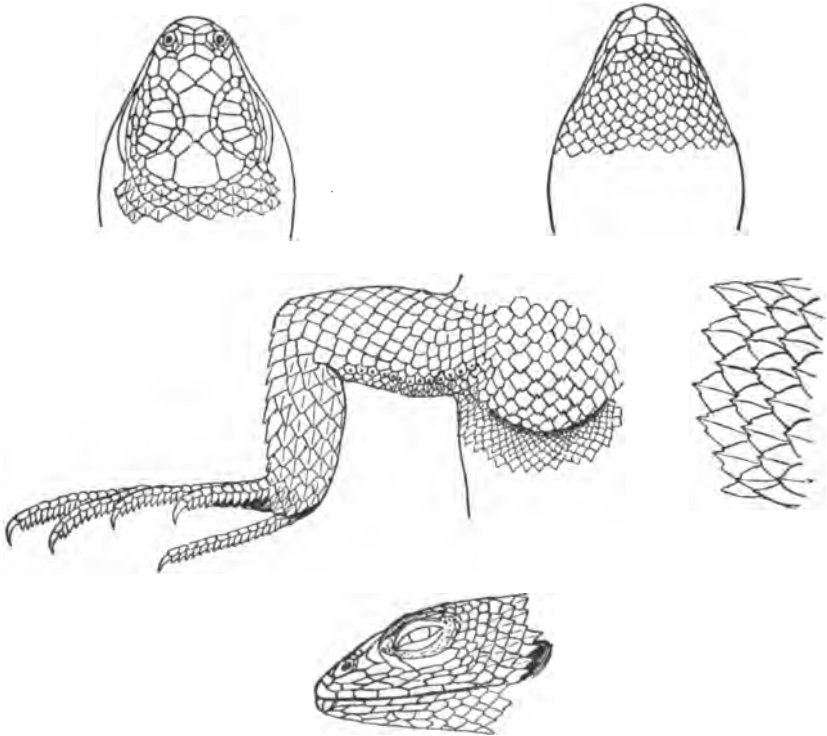


Fig 55.

SCELOPORUS SPINOSUS WIEGMANN.

× ½.

Texas.

Cat. No. 10793, U.S.N.M.

One series of four or five, sometimes six, large transverse supraorbitals, with occasionally two or three smaller external ones, bordered internally and externally by a row of small ones, the former completely continuous, occasionally a few smaller plates. Cephalic plates large, with two single verticals, scales on back very large, and bristling, acutely pointed; strongly carinated, with a prominent spine, but the two or three lateral

denticulations indistinct. No conspicuous difference in width of scales on back, rump, and tail, the first mentioned much larger, their lateral scales about thirty-three oblique rows from head to tail, ten for cervical fold. Scales on inside of tibia and behind arms obsoletely carinated. Free portion of hind toe as long as, or even longer, than cephalic plates. Femoral pores about thirteen.

Color above greenish-yellow, with a series of dark transverse dorsal bands, not interrupted centrally on five rows of scales, a faint light lateral stripe beneath which are a few dusky blotches. Male with very little blue on the chin and sides of belly and a longitudinal blackish patch in point of shoulder.

The body of this species is stout, tapering from the middle to the head, which is scarcely as broad as, or not broader than, the neck. Inner orbital plates completely cutting off the large, supraorbital plates from those along the middle line of the head; sometimes there is an irregular indication of a smaller external series in a few plates. The cephalic plates are arranged as follows, beginning with the occipital: 3, 2, 1, 1, 2, 3, with perhaps three more to the plates surrounding the nostrils, these exclusive of the plates along the lateral ridge of the head. The lateral occipital plates are nearly as large as the median, which is nearly or quite in contact with that of the third series, separating the two of the second row. The plates of the sixth series are large and nearly equal. In one specimen (Cat. No. 2961*b*) there is a third or median small plate in the second and fifth series.

Scales not quite so erect on the tail as in some other species. Dorsal scales acute, broader than long. Those below are angular, but denticulated and smooth. The number of rows can not be readily made out, but there appear to be about forty around the body in the thickest part. There are, however, but five rows on the middle of back, in a space the breadth of the head.

The ground color of this species is a dull, light, olivaceous green (sometimes yellow). On the middle of the dorsal surface is a series of transverse bars, eight or nine in number, from head to above arms, and continued on the tail. These are sometimes sharply defined and black, sometimes obsolete, and occupy five rows of scales, covering only the inner half of the outer of these. On each side of these blotches is a clear, light stripe about one row and two half rows wide, best defined above the fore legs, where the light stripe is succeeded by a dusky longitudinal one, which in the males is sometimes strongly defined. Posterior to this the dorsal blotches are continued obsoletely and narrowly across on the sides. There is a black patch across the insertion of the fore leg in the male. The legs are barred transversely with yellowish and dusky, and in addition have various longitudinal lines of dusky on the outer surface, especially on humerus and tibia. The scales beneath, too, often show short (sometimes lengthened) longitudinal, well-defined blackish lines, the ground color being greenish-yellow or yellowish,

each scale often with a central line of lighter. There appears to be no blue on the chin, and that on the flanks is very faintly defined. There is not the slightest trace of a cervical collar, although sometimes a black patch on the shoulder.

Sometimes the dorsal bands are quite close together, with but little lighter interval. In Cat. No. 2935 the sides, between the fore and hind legs, are blue, changing to blackish internally, where there is a light interval of about six rows of scales. The color does not reach the groin.

This species has somewhat the appearance of *Sceloporus clarkii*, but

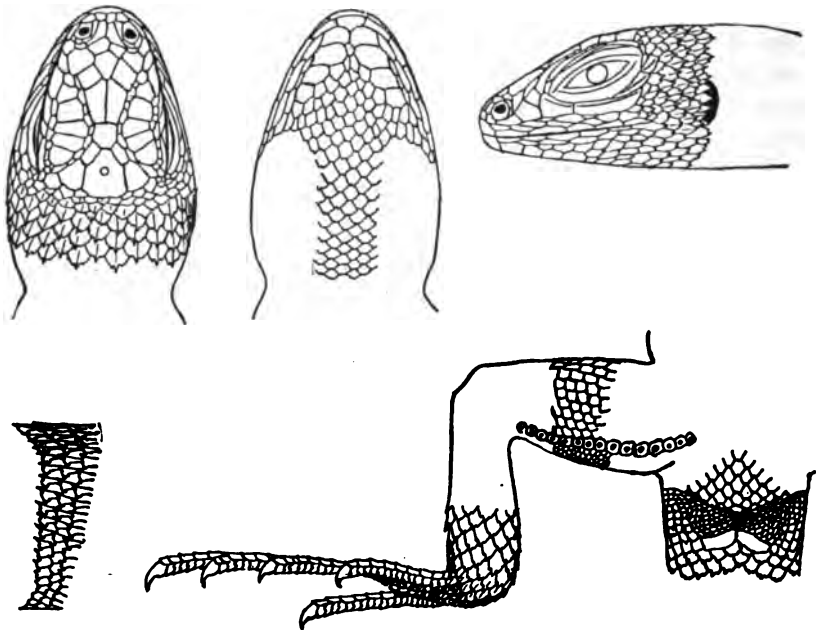


Fig. 56.

SCELOPORUS SPINOSUS WIEGMANN.

Type of *S. floridanus* Baird.

× 2.

Pensacola, Florida.

Cat. No. 2874, U.S.N.M.

is readily distinguishable. The large supraorbitals are bounded completely internally by a row of small plates, cutting them off from contact with the first two series, as in *clarkii*. The scales on the back are very much larger, and are disproportionately larger than those below. The coloration is entirely different. There is no blotch or interrupted collar on the side of the neck nor blue on the chin; the bands of the back are more transverse and continuous over five rows of scales, instead of being each in ten blotches. In high-plumaged males there is a black longitudinal patch extending from the insertion of the arm to the bare space under the lateral fold, scarcely united to the blackish band

immediately above the arm. This sometimes has a few blue scales anterior to it, but there are none on the chin. The *S. spinosus* grows to twice the bulk of the *S. undulatus*, which is its nearest ally in the genus.

Dr. Stejneger¹ thinks that the form above described is not the true *S. spinosus* Wiegmann, which, he says, has fewer femoral pores and is an inhabitant of Mexico. I have not been able to detect any such difference in the specimens at my disposal.

Sceloporus spinosus Wiegmann is abundant in southwestern and western Texas, as far north as the heads of the Medina and Guadalupe. I did not see it on the Llano. There are specimens in Mr. Boll's Dallas collections, but this gentleman informs me that it is very rare so far east. It ranges in north Texas chiefly west of Fort Worth. This lizard is especially arboreal, always ascending the trunks of trees when pursued. In this situation its somber colors afford it concealment. These are of different shades of brown without the brilliant blue and other colors of the two species of the genus already named. The range of this species extends as far east as Pensacola, Florida, whence Baird obtained the type of his *S. floridanus*.

Sceloporus spinosus Wiegmann.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2935	1	San Antonio, Texas.....	.....	Dr. Woodhouse.....	In alcohol.
2994	1	Point Isabelle, Texas.....	.....	G. Würdemann.....	do.
2968	1	El Paso, Texas.....	.....	J. H. Clark.....	do.
2835	1	San Diego, Texas.....	Apr. —, 1853	Lieutenant Couch.....	do.
2941	6	Matamoras, Tamaulipas..	.....	do.....	do.
2862	1	Brownsville, Texas.....	.....	Van Vliet.....	do.
2961	1	Indianola to Nenoes.....	.....	Captain Pope.....	do.
2943	1	Indianola.....	.....	Colonel Graham.....	do.
2921	1	Fort Bliss, New Mexico..	.....	Dr. Crawford.....	do.
2942	1	Buena Vista.....	May —, 1853	Lieutenant Couch.....	do.
2938	1	San Antonio, Texas.....	.....	Whipple.....	do.
2849	1	Rutersville, Texas.....	.....	Professor Forshey.....	do.
2834	1	Brownsville, Texas.....	.....	Van Vliet.....	do.
2839	3	Bracos River, Texas.....	.....	Dr. Shumard.....	do.
2961	4	Charco Exondido.....	Mar. —, 1853	Lieutenant Couch.....	do.
2902	2	Cadeveita.....	Apr. —, —	do.....	do.
2852	1	China.....	Mar. —, —	do.....	do.
2945	2	Between Laredo and Camargo.	.....	Major Emory.....	do.
2954	12	Matamoras, Tamaulipas..	.....	Lieutenant Couch.....	do.
2922	12	do.....	.....	do.....	do.
5068	1	Pecos River, Texas.....	.....	Lieut. Charles Call.....	do.
9397	7	Matamoras, Mexico.....	.....	Lieut. B. Couch, U. S. A.	do.
2961	1	Charo Iscendido.....	.....	do.....	do.
2917	1	San Antonio, Texas.....	.....	Dr. S. W. Woodhouse.....	do.
9199	1	.....	.....	.....	do.
10793	1	San Antonio, Texas.....	June —, 1879	C. W. Schuermann.....	do.
10794	1	do.....	do.....	do.....	do.
15462	1	San Diego, Texas.....	.....	W. J. Taylor.....	do.

¹ North American Fauna, No. 7, 1893, p. 178.

SCELOPORUS UNDULATUS Latreille.

- Sceloporus undulatus* WIEGMANN, Isis, 1828, p. 369; Herpet. Mex., I, 1834, p. 48.—FITZINGER, Syst. Rept., 1843, p. 75.—GIRARD, Herpet. U. S. Expl. Ex., 1858, p. 379, pl. XIX, figs. 15-21.—BOCOURT, Miss. Sci. Mexique, Reptiles, 1874, p. 195, pl. XVIII bis, fig. 11.—COPE, Proc. Amer. Phil. Soc., 1885, p. 395.—BOULENGER, Cat. Liz. Brit. Mus. II, 1885, p. 227.
- Lacerta undulata* BOSC, manuscript.
- Stellio undulatus* LATREILLE, Hist. Rept., II, 1802, p. 40.
- Agama undulata* DAUDIN, Hist., Rept., III, 1805, p. 384.—HARLAN, Journ. Acad. Nat. Sci. Phila., VI, 1829, p. 13.
- Lacerta fasciata* GREEN, Journ. Acad. Nat. Sci. Phila., I, 1818, p. 349. (Female.)
- Lucerta hyacinthina* GREEN, Journ. Acad. Nat. Sci. Phila., I, 1818, p. 349. (Male.)
- Uromastix undulatus* MERREM, Tent. Syst. Amph., 1820, p. 57.
- Tropidolepis undulatus* CUVIER, Règne An., 2d ed., II, 1829, p. 38.—GRAY, Syn. Rept. Griff. Cuv., IX, 1831, p. 43; Cat. Liz. Brit. Mus., 1845, p. 208.—DUMÉRIL and BIBRON, Erp. Gén., IX, 1837, p. 298.—HOLBROOK, N. Amer. Herpt., 1st ed., III, 1838, p. 51, pl. VIII; 2d ed., II, 1847, p. 73, pl. IX.—AUG. DUMÉRIL, Cat. Méth. Coll. Rept. Mus. Hist. Nat., 1851, p. 76.
- Sceloporus occidentalis* BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, October, 1852, p. 175; California.—GIRARD, Herpet. U. S. Expl. Exped., 1858, p. 383, pl. XIX, figs. 8-14.
- Sceloporus frontalis* BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, October, 1852, p. 175, Oregon.—GIRARD, Herpet. U. S. Expl. Exped., 1858, p. 384, pl. XIX, figs. 1-7.
- Sceloporus undulatus thayerii* COPE, Bull. U. S. Nat. Mus., No. 1, 1875, p. 49; not *S. thayerii* of Baird and Girard.
- Sceloporus longipes* BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 254.
- Sceloporus elongatus* STEJNEGER, N. Amer. Fauna, No. 3, 1890, p. 111.

Cephalic plates smooth or longitudinally rugose, especially anteriorly, and laterally. Supraorbital region with one crescentic series of five or six large, transverse plates, embracing a short series of three or four additional outer and inner series of small plates in its concavity. Two frontal plates, one before the other, the anterior undivided, usually with a third anterior and adjacent one so arranged as to be surrounded by four plates. Free part of longest hind toe equal to the length of cephalic plates. Scales of back and rump about equal, smaller than those near base of tail. Lateral scales smaller than dorsal. Dorsal scales angular pointed, well carinated, with conspicuous spines, and the lateral denticulations indistinct. The belly scales smooth and strongly emarginated. The scales on inside of tibia distally and behind anus decidedly carinated. Femoral pores about fourteen. There are about forty-one oblique rows of scales from head to tail, about twenty-three from cervical fold.

Color above, brownish olive to green. An indistinct or obsolete light stripe on each side, separated above by about 10 rows of scales; on each side a series of narrow, undulating Vs, the angle anterior, and in the light line; the inner legs of opposite marks more or less approximated. Male with posterior half (or more) of the chin and thence on each side

to shoulder, black; the former with two usually confluent blue spots. Sides dusky. A blue patch on each side of the belly; black internally and behind. Female without the blue and black of under parts, which are whitish, with short, dark longitudinal lines.

There are three well-marked color forms or subspecies of the *S. undulatus*, which differ as follows. The characters given are, however, not without exceptions:

Head scales usually wrinkled; color brown, with undulating brown cross bars	<i>S. u. undulatus</i> .
Head scales smooth; two pale dorsolateral stripes, or small, brown, dorsal spots; smaller	<i>S. u. consobrinus</i> .
Head scales smooth; green, with eight cross bands	<i>S. u. tristichus</i> .

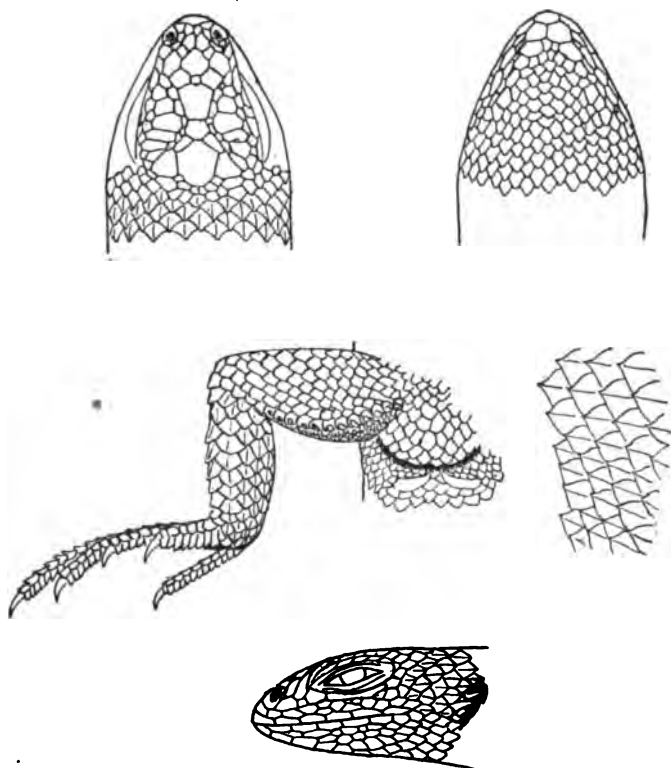


Fig. 57.

SCELOPORUS UNDULATUS LATREILLE.

= 1.

Alabama.

Cat. No. 9090, U.S.N.M.

Of these subspecies the *S. u. undulatus* is found across the continent; the *S. u. consobrinus* is Texan and Sonoran; while *S. u. tristichus* is only known from the Rocky Mountains.

SCELOPORUS UNDULATUS UNDULATUS Latreille.

Sceloporus undulatus undulatus COPE, Check List Batr. Rept. N. Amer., 1875, p. 48.

Sceloporus undulatus BAIRD, U. S. Pacific R. R. Reports, X; Whipple's Report, Reptiles, p. 37.

This species is of rather small size, plates on the anterior portion of head above, with a tendency to being rugose carinate, the more posterior with a slight trace of the same. Smaller supraocular scales squamiform or imbricate and carinate. The neck is constricted and narrower than the head. The plates of the head exhibit a considerable amount of variation, so that it is difficult to say what is the true formula of arrangement. There is, however, always a complete line of small scales along the inner edge of the supraorbital space separating the larger plates from those along the central line of the head. The most common plan, beginning with the parietals, is 3, 2, 1, 1, 2, 3. The middle parietal is considerably larger than the lateral, and is generally separated from the third single plate by the two of the second series. Sometimes each of the latter is divided into two, one before the other, the anterior pair in contact, the posterior separated by the middle occipital. The fifth series of the plates has frequently (perhaps almost always) a third median, much smaller one. The sixth series sometimes has five plates transversely, exclusive of those on the lateral edge of the head. Anterior to the sixth series is another of three, five, or more small plates, separating it from those around the nostrils.

It is difficult to determine the number of scales encircling the body, owing to the obliquity of the rows on the sides, those on the back and belly being longitudinal. There are, as nearly as can be ascertained, about forty-four series, and about forty along the back from occiput to above anus. The scales on the back are all acute, and strongly carinated and spinous behind, with one or two rather obsolete denticulations on each side. As usual, the belly scales, though denticulate, are smooth. There are about seven scales from the orbit to the ear. There are about thirteen well-defined femoral pores. The feet appear to be lengthened; the free part of longest hind toe equal to the head to end of occipitals.

This species is of a brownish olive or gray above. There is a central dorsal portion covering about ten dorsal rows, margined by a line of still lighter. On each side of the back, from head to anus, are eight or ten narrow, rather undulating V-shaped dark angular bands, the angle anterior and situated in the edge of this light dorsal portion. The inner legs of these angles sometimes nearly meet on the back, forming undulating Vs with the angle behind. The space on the back, immediately behind the dark bands, is generally lighter than the ground color, especially in the light lateral stripe. In the female the outer legs of the lateral V-marks are pretty distinctly visible. In the male they are generally (not always) obliterated by a nearly continuous dusky band, which extends from the black in front of the shoulder to the groin; the axilla, however, uncolored, as also a narrow lateral line from

it to the insertion of the hind leg. The male also has the entire under surface of the head black, with a large blue patch behind. The throat and sides of neck, from the lateral fold to and along the anterior face of the arm, are black. There is a large blue patch on each side of the belly from (but not in) the axillæ to the groin. This is black internally, where the shape is elliptical, the two of opposite sides separated when nearest by about two scales. In the groin the color is chiefly black, and this sometimes covers the whole anterior surface of the thigh and the preanal region. The black along the belly is sometimes confluent with that anterior to the arm, but there is usually an interruption connecting the grayish of the thoracic region with that of the inner surface of the arm, and producing a distinct cross. The scales on the under surface, where not colored as described, are white, finely punctate with black, producing a grayish appearance. This mottling is sometimes aggregated into distinct short lines, most conspicuous in the female. The head has some transverse dark lines above.

In the female the sides sometimes appear spotted with whitish, from the tips, single scales being of this color. There is occasionally a trace of blue on the chin and sides, and generally of black at the insertion of the arm.

The shade of coloration varies considerably, being sometimes so dark as entirely to obscure the markings. The tip of the chin in the male is sometimes greenish white when not very highly colored; in fact, this is most generally the case.

Many specimens exhibit a series of dusky lines about the head, among them two or three crossing the upper part, the median one opposite the center of the eyes. There are also usually two lines backward from the posterior canthus, one directed toward the occiput, the other crossing the upper end of the ear and confluent with the dusky of the sides.

Professor Baird distinguished the Pacific slope representatives of this species as a species under the name of *S. occidentalis* Baird. He states the difference from Eastern specimens to be as follows:

The first positive difference is seen in the greater roughness of the dorsal and lateral scales, owing to the greater prominence of the keels of each scale. Each scale is more elongated and pointed owing to the greater prominence and backward extension of the mucro, and the edges on each side the spine have two distinct serrations instead of scarcely any. On the other hand, however, the belly scales are many entirely without notch, and this where present is always very slight or obsolete, while in *undulatus* one or more are seen distinct and angular in every scale; a difference which appears to be constant consists in the entire smoothness of the scales on the inner or under surface of the tibial joint, and those on the under surface of the tail for a distance behind the anus nearly equal to the length of the head. The posterior edge of these scales is angular or truncate, without any mucro, and with or without a median notch. In *S. undulatus* the scales on the under side of the tibia are all distinctly carinated, mucronated, and with lateral notches, those behind the anus being similarly constituted except one or two first rows. The plates under the chin are decidedly smaller and more numerous. Those on the back appear smaller likewise.

The colors are so very similar that with the materials before me I can scarcely indicate any constant difference. The colors appear rather darker, and the legs of

the v-shaped marks are more thickened except at the extreme angle, so as to have somewhat the appearance of being broken up into two series of blotches on each side, the upper leg of the v separated from the lower by the light line and thickened so as to appear somewhat triangular.

I do not find the characters above mentioned to be sufficiently constant to warrant the recognition of these Pacific forms as either species or subspecies, although I formerly¹ recognized them as *Sceloporus*

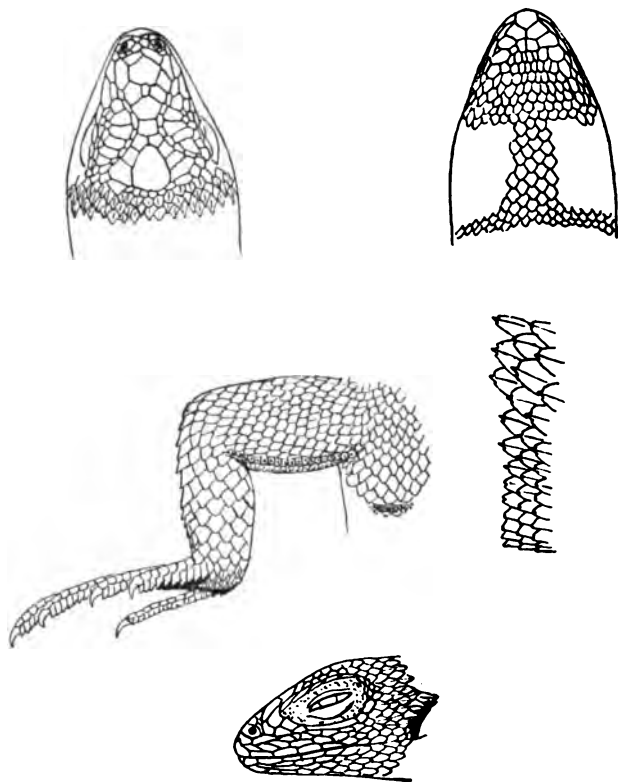


Fig. 58.

SCELOPORUS UNDULATUS UNDULATUS LATREILLE.

= 1.

California.

Cat. No. 8662, U.S.N.M.

undulatus thayerii, a name which is properly applicable to a Texan form.

Professor Baird also distinguished a long-legged race from southern California under the specific name of *S. longipes* Baird. I do not find this character constant enough to warrant such recognition. Professor Baird describes it as follows:

Hind foot and fore leg from elbow contained about two and a half times in the total length of head and body, the entire hind leg longer than the body alone, and

¹ Check List North American Batrachia and Reptilia, p. 49.

extended forward, reaching almost or quite to the eye. Free portion of longest toe longer than the cephalic plates. Tail one and a half times the head and body. Femoral pores very distinct and large. Scales on inside of femur and on belly smooth. General characters of form and coloration as in *S. undulatus*.

The general characters of this form are much as ascribed in *S. occidentalis*, the most striking difference consisting in the much longer limbs, appreciable on the slightest comparison. It attains a considerably larger size, and the coloration is more vivid beneath, the blue of chin and sides more extended. The femoral pores are much more conspicuous. Its range is different, being confined to southern California or to the mountainous interior, while the other belongs to the northern coast region and to Oregon and Washington.

A form from Arizona is described by Stejneger, under the name *S. elongatus*, as having very elongate hind legs and tail. The hind leg measures 52 mm., while the body measures 60 mm. The leg is therefore not so long as in the *longipes* form. It does not differ otherwise from the *S. undulatus*.

The *Sceloporus undulatus*, or "Fence lizard," as it is commonly called, is abundant in dry and wild regions in the Alleghenian and Carolinian districts of the Eastern region. It is usually seen running on fences, logs, or trunks of trees with great activity, alternating with periods of watching of the intruder on his haunts. It is very expert in dodging round the bodies on which it rests, defying for a long time attempts to capture it.

Prof. O. P. Hay¹ writes as follows about the habits of this species:

These little animals are extremely active, and they are able to run with great swiftness. Holbrook says that they are often found under the bark of decaying trees. It chooses also old fences as its basking places. It is given to climbing trees in search of insects and for safety from pursuers. De Kay states that when irritated in confinement they elevate their spinous scales in such a manner as to present a very formidable appearance. They are perfectly harmless, although they are often regarded as venomous. De Kay further states that they are able to alter their colors, the back assuming an azure tint.

The eggs are said to be laid in the sand, probably in little groups. They are deposited about June 1, and are hatched about July 10. The eggs are long and narrow, are covered with a tough coat, and are without any calcareous material. The eggs weighs about 20 grains. They are abandoned to their fate, but when the young are hatched they are treated with the utmost gentleness by all the adults.

Sceloporus undulatus undulatus Latreille.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2830	1	Red Fork, Arkansas.....	1850	Dr. Woodhouse.....	Alcoholic.
2869	1	Franklin County, Mississippi.....	.....	Dr. Evans.....	do.
2834	2	St. Louis, Missouri.....	.....	Dr. Engelmann.....	do.
2840	1	Fort Towson, Red River, Arkansas.....	.....	Dr. L. A. Edwards.....	do.
2870	1	Pole Creek.....	July 27, 1856	Lieut. Bryan.....	do.
2884	2	Near mouth Poteau River, Arkansas.....	.....	Lieut. Whipple.....	do.

¹ The Batrachians and Reptiles of the State of Indiana. Indianapolis, 1893, p. 133.

Sceloporus undulatus undulatus Latreille—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2903	1	Fort Dallas, Oregon.....		Governor Stevens.....	<i>S. frontalis</i> .
18143		Monterey, California.....	Oct. 6	Bailey.....	do.
18144		do.....	Oct. 3	do.....	do.
18145		do.....	Sept. 29	do.....	do.
18146		do.....	Sept. 30	do.....	do.
4358	15	Fort Tejon, California.....		Q. X. DeVesey.....	<i>S. longipes</i> .
4359	10	do.....		do.....	do.
4115	1	Tejon Valley, California.....		Lieut. Williamson.....	do.
2872	2	El Dorado County, California.		Dr. Boyle.....	do.
2847	2	Salt Lake, Utah.....		Capt. Beckwith.....	do.
2923	1	San Diego, California.....		Mr. Cassidy.....	do.
2863	1	Salt Lake.....		Capt. Beckwith.....	do.
2828	4	California Mountains.....		Mr. Skilton.....	do.
18511-12	2	Colorado Desert, San Diego County, California.		C. R. Orcutt.....	do.

SCELOPORUS UNDULATUS TRISTICHUS Cope.

Sceloporus tristichus COPE, Report U. S. Expl. Surv. W. 100th Mer., Zoology, V, 1875, p. 571.

Scales of the head smooth; supraorbitals in only three rows; a median series of transverse plates bounded by a row of small ones internally

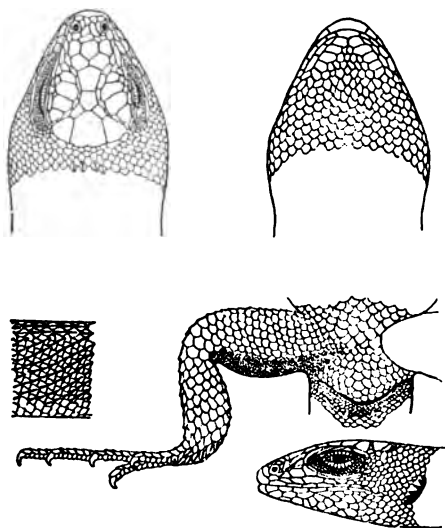


Fig. 59.

SCELOPORUS UNDULATUS TRISTICHUS COPE.

× 1.

New Mexico.

Cat. No. 8613, U.S.N.M.

and externally; frontal divided transversely; interparietal wide as long; parietals undivided; scales in forty rows from head to base of tail, well keeled and strongly mucronate, a little larger than its lateral, which about equal the ventral; four preauricular free scales; a granular patch behind lateral fold of neck; when the short hind legs are extended forward, the end of the external toe reaches the axilla and the longest toe reaches the prehumeral pocket; femoral pores, sixteen. Color light olive-brown, with a pale lateral band on each side, separated by seven rows of scales. This dorsal space is crossed by undulating, narrow, black cross bands,

which are interrupted in the middle and pale-bordered behind; a brown band from the eye to the middle of the side, where it is broken into spots; legs and feet black-speckled; some black longitudinal lines on posterior face of thigh; blue of the sides well separated below; a sub-

round blackish-blue spot on each side the throat. This subspecies is about the size of the *S. u. consobrinus*, but it rather resembles in color the *S. u. undulatus*. It has only one occipital plate on each side, and the arrangement of the supraocular plates is unlike that of any other species. Posteriorly the large transverse supraoculars are only separated from the superciliaries by a single series of lanceolate scales like the superciliaries. For their anterior half they are separated from this lanceolate series by two or three wider scales, forming a single row. There are two to three rows of rounded scales in the same position in the *S. u. undulatus* and *S. u. consobrinus*. In the former subspecies from both coasts there are two rows of scales between the suborbital plate and the superior labials. In the *S. u. tristichus* there is only one such row, which consists of lanceolate scales. Thus this form differs from the *S. undulatus* in a direction the opposite of the *S. biseriatus*.

As to colorations, there are eight cross bands between the groin and axilla, while in the *S. u. undulatus* from both coasts there are five or six.

Measurements.—Total length, 132 mm.; length to vent, 59 mm.; length to axilla (axial), 27 mm.; length to ear (axial), 14 mm.; length of fore leg, 24 mm.; length of fore foot, 11 mm.; length of hind leg, 37 mm.; length of hind foot, 18 mm.

This form differs considerably in appearance from the *S. undulatus*, but as it is represented by but one specimen it may turn out to be a variety of that widely distributed species.

Sceloporus undulatus tristichus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.
8613	1	Taos, New Mexico.....	U. S. G. G. Survey West of 100th Meridian. Dr. H. C. Yarrow.

SCELOPORUS UNDULATUS CONSOBRINUS Baird and Girard.

Sceloporus consobrinus BAIRD and GIRARD, Marcy's Report on Red River, Reptiles, 1853, p. 237, pl. x, pp. 5-12.—BAIRD, U. S. Pac. R. R. Surveys, Whipple's Report, Reptilia, 1859, p. 5.—COPE, Bull. U. S. Nat. Mus., No. 17, 1880, p. 17.—STEJNEGER, N. Amer. Fauna, No. 3, 1890, p. 111.

Sceloporus garmani BOULENGER, Proc. Zool. Soc. Lond., 1882, p. 761, pl. LVI.

Supraorbital region with one crescentic series of six large transverse plates, embracing a much smaller one (of four or five) in its concavity, the whole bordered by a complete row internally and externally. Two central single plates, with a third more anterior, surrounded by five others, the plates all smooth. Occipital large, with two or three plates on each side, free portion of longest hind toe reaching to middle of occipital plate. Scales of back, rump, and sides of body not conspicuously different in size, those of tail alone larger. Dorsal scales angular, strongly carinated, mucronate with free spines and with lateral

denticulations, the belly scales decidedly notched. Scales in inside of femur and behind anus smooth. There are about forty-one oblique series from head to above anus; about thirty from the lateral cervical folds.

General color above, yellowish olive, with two well-defined narrow lines separated by about eight scales, and a broad median dorsal stripe of the ground color. Between each lateral and the dorsal stripe is a series of well-marked oblique short lines about two scales wide. **A**

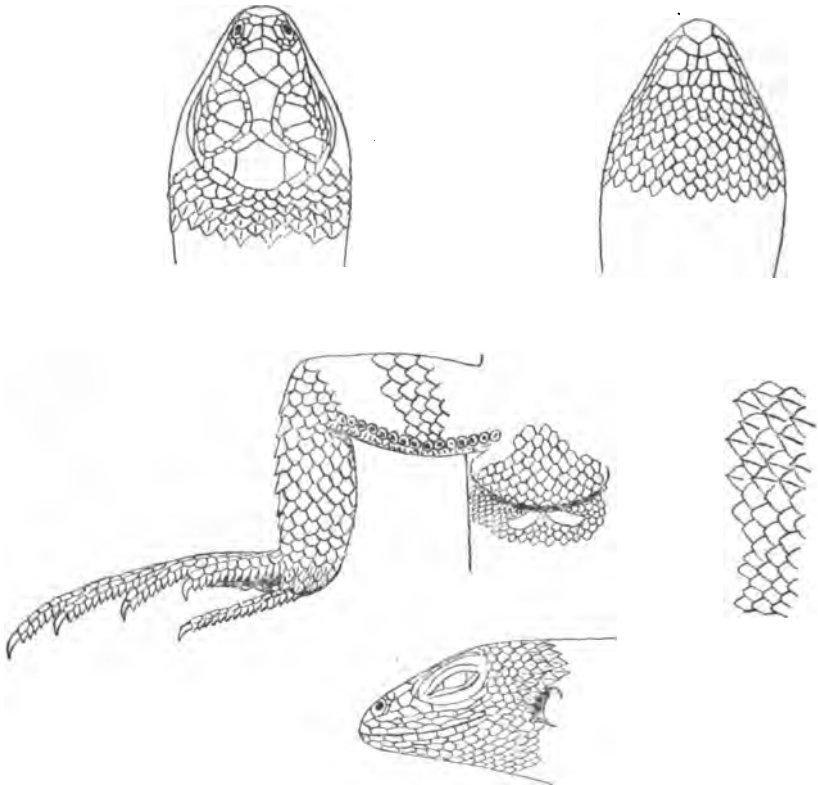


Fig. 60.

SCELOPORUS UNDULATUS CONSOBRINUS BAIRD AND GIRARD.

= 1.

Cat. No. 15695, U.S.N.M.

dusky lateral stripe, with a yellowish one below it; a short horizontal line on the shoulder; beneath yellowish; tail without bands; sometimes a row of dusky blotches above. Male with two confluent bluish spots on each side the chin. Side of belly bluish; cephalic plates somewhat as in *S. thayeri*.

The prevailing color of this species is an olivaceous yellow, seldom greenish. On each side are two unusually well-defined stripes of clear yellow, the upper especially, which begins a little above the lateral

fold and runs back to the tail, which appears entirely without adjacent bars. It occupies a width of two half scales, the innermost of opposite sides separated on the back by a width of six scales (sometimes seven?), the outermost separated by about three rows from the lower lateral stripe, which is bordered below by dusky, the under parts being yellowish. Between the lateral light lines is a dusky stripe, quite dark in adult males, though spotted with yellowish and really commencing behind the eye as a narrow line. Along the central line of the back is a broad stripe of the ground color, without blotches, and four rows of scales wide, and the interval between this space and the lateral stripes (one and two half scales) is crossed obliquely by a succession of about ten oblique dusky bars, from head to above anus. These bars are really the thickened inner legs of V-shaped marks, the outer legs in the dusky lateral stripe, but more or less obscured there, and sometimes quite indistinct on the back. In the male there is a dull patch of bluish on each side of the belly, but no black border. The dusky stripe below the lower lateral line, however, runs on to the anterior face of the thigh. The blue patches are separated on the belly by a wide interval. There is a blue patch, sometimes confluent and suffused with black, on each side of the chin. There is a short blackish line from the lateral fold to the shoulder, and several transverse ones across the top of head.

The general impression of color at a distance is that of a yellow-olive sheen, with two lateral yellowish stripes and three dusky ones (the upper a series of blotches), with a broad uncolored stripe down the middle of the back. There is no tendency to a meeting of the dorsal blotches, nor are there any bands on the tail.

This form appears to me to be rather a race of the *S. undulatus* than a distinct species. I at one time supposed it to be characterized by the presence of two parietal plates on each side, but I find, on examining larger material, that this character is entirely exceptional. In fact, there is no material difference in the plates of the head between this species and *undulatus*, except that they are smoother. The scales of the hind leg and undersurface of tail are, however, much smoother. The most appreciable difference is in color, the latter never having the sharply defined yellow lines on each side, nor the broad unblotched stripe on the back. The tail of *consobrinus* also is always without blotches, except occasionally on the median line. The blue marks on the belly and chin are less intense.

The smoothness of the scales on the inside of the hind leg must be relied on in many cases to distinguish the species from *S. thayeri* (of much the same size) when the lateral markings are obscure. Even in this case, however, the light dorsal interval will generally be found well defined, and the tail without lateral, if any, blotches.

Specimens from the Upper Colorado region, Cat. Nos. 4360-4362, differ in some respects from the type, with an approximation to *S. undulatus*.

This lizard is found all over Texas and is very variable in its charac-

ters. It always has about twenty-eight transverse series of keeled unimacronate scales between the interscapula and interfemoral regions, and the lateral scales are not larger than the ventral. The head scales are smooth. There may be three or two rows of supraorbitals between the internal and superciliary scales. The colors are often brilliant, especially in specimens from near San Antonio, where the sides of the neck and head are often of a bright rufous and the tail reddish and yellowish-brown at the base. It is very abundant from Dallas west to Fort Concho, and southwest to San Antonio, and in the first plateau region to the head of the Medina River. It is found on the ground, but always takes refuge in trees, running on and around the limbs with great agility.

According to Stejneger¹ this species is common in the cedar belt of the San Francisco Mountain plateau in Arizona.

Sceloporus undulatus consobrinus Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4109	6	San Pedro, Texas		Colonel Graham	A cobolite.
2910	3	Canadian		Whipple	do.
2905	3	Near Canadian		do.	do.
2855	1	Red River		Captain Marcy	do.
2880	1	Between Pecos River and San Antonio, Texas.		Major Emory	do.
2895	10	Sand Hills, Nebraska.		Dr. Hayden	do.
2906	1	Gaudalupe and Rio Pecos.		Captain Pope	do.
2908	1	Headwaters of Trinity River.		do.	do.
2853	1	Santa Rita del Cobre.		Dr. Webb	do.
2893	1	Fort Pierre, Nebraska		Governor Stevens	do.
2876	1	Texas		Captain Pope	do.
2854	1	Between El Paso and Janos, Mexico.	—, 1855	Major Emory	do.
2936	1	Verdigris		J. H. Clark	do.
2898	2	Sonora		Colonel Graham	do.
2863	1	City of Chihuahua		J. Potts	do.
2899	1	Between Janos and San Luis Spring.		Major Emory	do.
2937	12	Sand Hills, Nebraska		Dr. Hayden	do.
2833	4	Republican River	Sept. 27, 1853	Lieutenant Bryan	do.
2868	2	Fort Pierre, Nebraska		Lieutenant Warren	do.
4360	1	Little Colorado	—, 1858	Lieutenant Ives	do.
4361	1	Upper Colorado		do.	do.
4362	1	San Francisco Mountains		do.	do.
8491	1	Fort Wingate, New Mexico.	July 15, 1874	A. C. Barry	do.
8520	1	San Juan River, New Mexico.		Lieut. R. Birney, U. S. A.	do.
5240	3	Taos, New Mexico		Capt. R. Anderson, U. S. A.	do.
8161	1	Dome Canyon, Utah		Dr. H. C. Yarrow	do.
8163	2	Fairfield, Utah	—, 1872	do.	do.
8555	1	Southern Arizona	Oct. —, 1873	H. W. Henshaw	do.
4925	1	Carsons Pass		C. McCarthy	do.
4821	1	Nebraska			do.
4865	1	Santa Fe, New Mexico		Howard	do.
5352	4	Yellowstone		Reynolds & Hayden	do.
2899	1	San Luis, New Mexico		Maj. W. H. Emory, U. S. A.	do.
8584	1	Apache, Arizona	July —, 1875	Dr. O. Loew	do.
8606	3	Olamchu Peak, California	Sept. —, 1875	H. W. Henshaw	do.
8607	2	California	—, 1875	do.	do.
8609	8	Santa Barbara, California	June —, 1875	do.	do.
8643	1	Mohave Desert, California	July —, 1875	Dr. O. Loew	do.
8664	2	Virginia City, Nevada	—, 1875	Exp. W. of 100 M.	do.
9548	1	Fort Wingate, New Mexico.	—, 1874	H. W. Henshaw	do.

¹ North American Fauna, 3, 1890, p. 111.

Sceloporus undulatus consobrinus Baird and Girard—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
9634	1	Pescado, New Mexico.....	July —, 1872	H. W. Henshaw	Alcoholic.
12673	5	La Paz, L. California.....	— —, 1882	L. Belding.....	do.
15547-9	3	Cook County, Texas.....		G. H. Ragsdale.....	do.
15686-7	2	Blackfoot Fork.....		Dr. Hayden.....	do.
16827-84	2	Tucson, Arizona.....		P. L. Jony.....	do.
16927-30	7	do.....		do.....	do.
16958-6	3	do.....		do.....	do.
17234-5	2	do.....		do.....	do.
21256-8	3	Long Pine, Nebraska.....		U. S. Fish Commission.....	do.
21488	1	Hot Springs, Arkansas.....		H. H. & C. S. Brimley.....	do.
22292-94	3	Monilton, Arkansas.....		F. C. Test.....	do.
17648-9	2	Near Pine Ridge Agency, South Dakota.....			" <i>S. garmantii</i> ."

SCELOPORUS BISERIATUS Hallowell.

Sceloporus biseriatus HALLOWELL, Proc. Acad. Nat. Sci. Phila., VII, 1854, p. 93 (Pasa Creek and El Paso); Report Reptiles Williamson's Exp.; Reports of the Expl. and Surv. for Pacific R. R., X, 1835, p. 6, pls. VI, VIII.—BOCOURT, Miss. Sci. au Mex., Rept., 1874, p. 197, pl. XVIII bis, fig. 10.—STEJNEGER, North American Fauna, No. 7, Pt. 2, 1893, p. 184.

Sceloporus smaragdinus COPE, U. S. G. G. Survey West of the 100th Mer., Zoology, V, 1875, p. 572, pl. XXIV, fig. 2, 1874, not of Bocourt; Proc. Acad. Nat. Sci. Phila., 1883, pp. 15, 18.

Sceloporus undulatus smaragdinus COPE, Proc. Amer. Phil. Soc., XXII, 1885, p. 399.

Sceloporus undulatus var. *bocourti* BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 229.

Supraorbitals in one series of five large transverse plates, margined internally by one series and externally by two of smaller hexagonal ones within the superciliaries. Cephalic plates large, regular, smooth. Free portion of longest hind toe equal to the length of cephalic plates above. No decided difference in breadth of scales on back, rump, or tail above; the first, however, decidedly larger than those on sides. Dorsal scales angular, but the edges rather rounded, with moderate carination, very slight spine, and almost no lateral denticulation; the belly scales scarcely or not at all notched. Scales on inside of tibia smooth, without mucro. Femoral pores 14-16. About fifty oblique series of dorsal scales; thirty-five firm gular fold. Femoral pores about twenty.

Above olivaceous gray (green to blue in life), with the dorsal series of rounded blotches, bordered behind with lighter gray. No cervical collar, but one or two small spots on shoulder. Chin and sides of male faintly blue.

Head large and broad. Plates 3 (occipital), 2, 1, 1, 2, 3, and 4 to the four internasals. Lateral parietals large. External two rows of supraoculars flat and smooth, hexagonal, and truncate posteriorly. Only one row external to the last one or two large supraoculars. Five acuminate free scales bounding auricular meatus in front.

The scales are small, there being but about fifty oblique series from

head above to tail, and about sixty-five around the body. They become smaller from the back to the sides, where they scarcely if at all exceed the belly scales. Abdominal and gular scales slightly notched at apex. The extended hind leg reaches to the orbit.

The ground color of this species above is a light olivaceous-gray with ten dorsal series of about ten round blotches, bordered behind by a lighter shade of the ground color. These blotches are three or four scales wide. There are faint indications of a lateral series of the same spots, but without any intervening light line. The hinder part of the thigh shows two blackish lines. There is a small blackish spot on the shoulder and another above it, but no indication of a collar. This

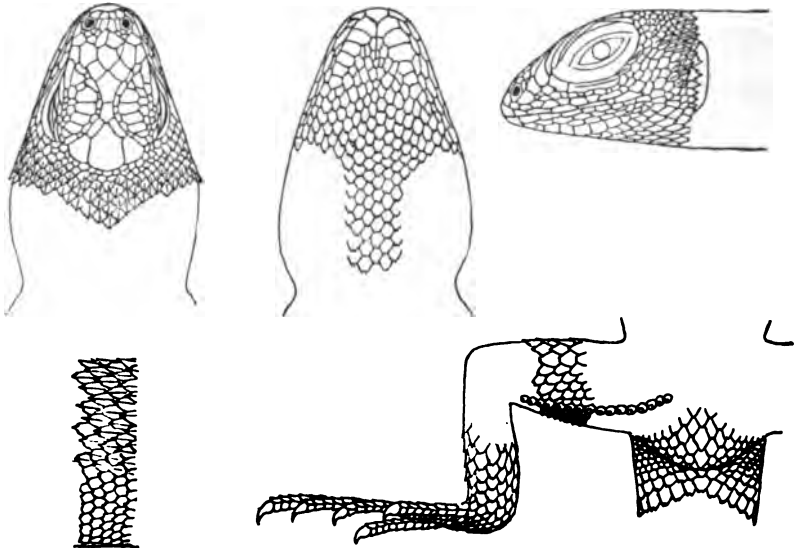


Fig. 61.

SCELOPORUS RISERIATUS HALLOWELL.

× ½.

Utah.

Cat. No. 8619 U.S.N.M.

region and that of the groin show a few light yellowish spots. The sides of the belly and the under surface of the head are blue, the latter with the blue posterior, and anteriorly with a median light line and scattered spots. In old males the throat, middle of belly, and inferior side of femur may be black.

This species is quite well marked, and is not likely to be confounded with any others from the West, excepting, perhaps, *S. undulatus*. In this it differs in the larger size and the smoother and smaller scales, as well as in the plates of head, and the hexagonal shape and smoothness of the smaller supraoculars. Its limbs are longer, greatly exceeding in this respect *S. undulatus*.

This is the Great Basin species of the *S. undulatus* group, ranging as far southeast as San Bernardino, California. It is the handsomest of them, but displays great variety in the coloration, which, however, always displays green on the upper surfaces, and frequently blue. I have taken it in the San Francisco Mountains, southwestern Utah, and Summer Lake, Oregon, which is the most northern locality known to me. In the specimen from the latter locality there is a row of turquoise blue spots on each side of the back.

In regard to the distribution of this species, Dr. Merriam, in the report on the results of the Death Valley expedition, remarks as follows:

Sceloporus biseriatus is one of the few lizards inhabiting both the desert ranges of the Great Basin and the interior valley of California. Specimens were obtained at frequent intervals all the way from the Upper San Joaquin Valley, in California, to the Upper Santa Clara Valley, in Utah, about 10 miles northwest of St. George. On the east side of the Great Divide, in California, it was obtained on the Panamint, Argus, Coso, White, and Inyo mountains, and at the east foot of the Sierra, in Owens Valley (on Independence Creek). On the west side of the Great Divide it was common on the west slope of Walker Pass, and thence down into Kern Valley to the neighborhood of Kernville, and southerly along the west slope of the Sierra to Havilah and Walker Basin, and northerly to Three Rivers. It was common also in the Cañada de las Uvas and in the Upper San Joaquin Valley, where specimens were collected on the Charleston Mountains (near Mountain Spring), on Mount Magruder, in the Juniper Mountains, and in the Grapevine Mountains.

A black form (having the belly intensely blue-black) was found on black lava rock in Diamond Valley, Utah; on the Charleston Mountains (near Mountain Spring), Nevada, where it was found both on rocks and on juniper trees, and on the White Mountains, near the eastern boundary of California. In the latter locality it was common on the summit of the Divide, near the road between Deep Spring and Owens valleys; where it was frequently seen on and among light-colored rocks, which made it unusually conspicuous. It is entirely possible, however, that this very striking contrast is a protection, causing the lizard to resemble the dark cracks in the rocks when viewed from above by passing hawks.

Sceloporus biseriatus Hallowell.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimens.
2836	1	Pacific R. R. survey	Lieut. Williamson	Alcoholic.
2820	1	...do	...do	do.
8612	1	Beaver, Utah	H. C. Yarrow	do.
.....	1	Nevada	...do	do.
.....	1	Dome Canyon, Utah	...do	do.
20230-53	.....	Witch Creek, Santa Ysabel, San Diego County, California.	H. W. Henshaw	do.
20350-78	.....	...do	...do	do.
20391-99	.....	...do	...do	do.
20486-88	.....	...do	...do	do.
20501-12	.....	...do	...do	do.
21166	.....	San Jacinto, California	Chas. H. Gilbert	do.
22588-91	.....	Near San Diego, California	C. R. Orcutt	do.

Sceloporus biseriatus Hallowell—Continued.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When received.	From whom received.
			<i>Feet.</i>		
18147	Male...	Panamint Mountains, California	8,000	Apr. 19	Nelson.
18148	Male...	do.	8,000	Apr. 4	do.
18149	Male...	do.	8,000	do.	do.
18150	Male...	do.	8,000	Apr. 3	do.
18151	Male...	do.	8,000	do.	do.
18152	Female...	do.	8,000	do.	do.
18153	Female...	do.	8,000	Mar. —	do.
18154	Male...	do.	8,000	Mar. —	do.
18155	Male...	Panamint Mountains, Willow Creek, California.	4,500	May 19	do.
18156	Male...	Panamint Mountains, Johnson Canyon, California.		Mar. 31	Fisher.
18157	Male...	do.		do.	do.
18158	Male...	do.		Apr. 1	do.
18159	Male...	do.		Apr. 2	do.
18160	Male...	do.		Apr. 4	do.
18161	Male...	do.		Apr. 10	do.
18162	Female...	do.		Apr. 4	do.
18163	Male...	Coso Mountains, Coso, California		May 18	do.
18164	Male...	do.		May 23	do.
18165	Male...	do.		May 21	do.
18166	Male...	do.		May 20	do.
18167	Female...	do.		do.	do.
18168	Female...	do.		do.	do.
18169	Male...	Old Fort Tejon, California.		June 28	Palmer.
18170	Male...	do.		do.	Merriam.
18171	Male...	do.		June 29	Palmer.
18172	Female...	do.		July 3	do.
18173	Male...	do.		July 5	do.
18174	Female...	do.		July 8	do.
18175	Male...	South Fork Kern River, 25 miles above Kernville, California.		July 7	Fisher.
18176	Male...	Kernville, California.		June 23	Palmer.
18177	Male...	do.		do.	do.
18178	Male...	South Fork Kern River, California.	2,750	July 7	Bailey.
18179	Male...	Walker Basin, California.		July 14	Fisher.
18180	Female...	do.		do.	do.
18181	Male...	Havilah, California.		June 24	Palmer.
18182	Female...	do.		do.	do.
18183	Female...	do.		do.	Merriam.
18184	Female...	Fresno County, Horse Corral Meadow, California.		Aug. 11	Palmer.
18185	Female...	do.		do.	do.
18186	Female...	do.		do.	Fisher.
18187	Male...	Walker Pass (west slope), California.		July 7	do.
18188	Male...	Cañada de las Uvas, California.		Oct. 14	Nelson.
18189	Young...	do.		do.	do.
18190	Male...	White Mountains, California.	8,000	June 9	Merriam
18191	Female...	Soda Springs, Kern River, California.		Aug. 15	Bailey.
18192	Male...	Three Rivers, California.		July 28	Fisher.
18193	Female...	Tulare, California.		July 21	Bailey.
18194	Male...	Kaweah River, East Fork, California.	5,600	July 29	do.
18195	Male...	San Joaquin River, California.	7,600	do.	Nelson.
18196	Male...	Argus Range, Shepherd Canyon, California.		May 7	Fisher.
18197	Female...	East slope High Sierra, Independence Creek, California.	6,000	June 21	Stephens.
18198	Male...	Charleston Mountains, Mountain Spring, Nevada.	5,600	Apr. 30	Bailey.
18199	Male...	do.	5,600	do.	do.
18200	Male...	do.	5,600	do.	Merriam.
18201	Female...	do.	5,600	do.	do.
18202	Male...	Mount Magruder, Nevada.		June 5	do.
18203	Female...	do.		do.	do.
18204	Male...	Juniper Mountains, 12 miles east of Panaca, Nevada.	6,700	May 19	Bailey.
18205	Female...	Grapevine Mountains, Nevada.	6,400	June 10	Nelson.
18206	Male...	Ten miles west of St. George, Utah ⁴ .	4,500	May 16	Bailey.

¹ Young.² About.³ Adult.⁴ On lava rock.

SCELOPORUS THAYERII Baird and Girard.

Sceloporus thayerii BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, 1852, p. 127.—BAIRD, U. S. and Mexican Bound. Surv., II, 1859, Reptilia, p. 6.—BOCOURT, Miss. Sci. Mex., 1874, p. 176, pl. XVIII, fig. 5.

Sceloporus consobrinus BAIRD and GIRARD, Marcy's Rept. Nat. Hist. Red River, 1853, p. 237.

Cephalic plates much as in *S. undulatus*. Frontal undivided. Free portion of long hind toe reaching from mouth to middle of occipital plate. Dorsal, rump, and caudal scales about equal, the front rather larger than the lateral scales. Scales above angular-pointed, with conspicuous keel and spine, with decided lateral denticulations. Belly scales are quite decidedly carinated, those on inside of the tibia and behind anus still more so. There are about forty-two oblique series of scales on each side the back, about twenty-eight or thirty from the cer-

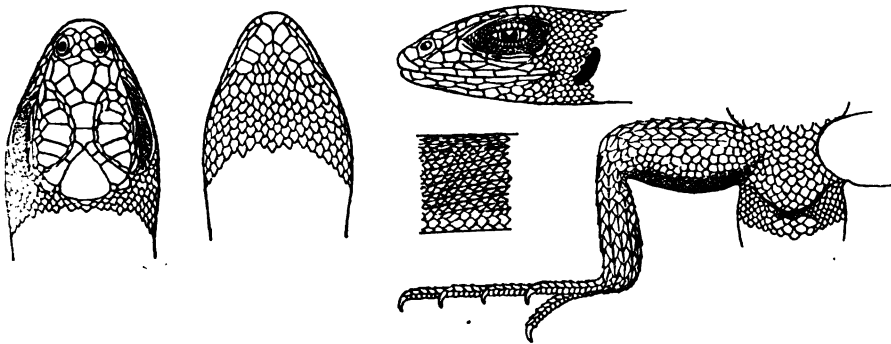


Fig. 62.

SCELOPORUS THAYERII BAIRD AND GIRARD.

× 2.5.

Texas.

Cat. No. 5987, U. S. N. M.

vical folds. Femoral pores about twelve or fifteen. Light lines on each side of the back, separated by six or seven scales only; between these two series of dark blotches. Male with a continuous, well-marked black stripe on the sides, from above the arm, and a blue patch on each side the belly; black internally and behind; a black patch on each side the posterior half of chin, sometimes (not always) confluent internally, each one with another always distinct one of blue.

This species has a close resemblance to *S. undulatus*, and sometimes is distinguished with great difficulty. The interparietal is larger, the parietals smaller, and two on each side instead of one. The scales are more strongly carinated. The light stripes on each side the back are near together, being separated by an interval of only six or eight scales instead of ten. The black lateral stripe is much more distinct. There is a greater interval between the blue patches on the belly. The blue

on the chin is in two patches instead of one, as is more generally the case (though not always) in *undulatus*. The size appears considerably less. The dorsal markings are more in the shape of triangular blotches, as in the form *S. occidentalis*, than in undulating narrow lines.

The lack of distinct yellow lines and the presence of the lateral black stripe, with the carination of inferior tibial and postanal scales, will distinguish it from *S. u. consobrinus*. This form is, so far as known, restricted to southwestern Texas. It is peculiar in the genus in the carination and acumination of the ventral scales, and in the same character of the scales on the inferior surface of the tibia. The scales external to the large series of supraoculars are less numerous than the species of this section, approaching very nearly to the type of *S. tristichus*.

Sceloporus thayerii.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2900	1	San Antonio, Texas.....	Dr. Woodhouse.....	Alcoholic.
2859	1	Indianola, Texas.....	Capt. Pope.....	do.
2912	2	Eagle Pass.....	A. Schott.....	do.
2850	12	Indianola.....	Capt. Pope.....	do.
2887	3	do.....	Col. Graham.....	Type.
2896	3	San Pedro, Texas.....	do.....	do.
2907	1	Coal Creek.....	Lieut. Whipple.....	do.
3075	4	Fort Bliss, New Mexico.....	Dr. Crawford.....	do.
2864	2	Indianola to Nueces.....	Capt. Pope.....	do.

SCELOPORUS GRACIOSUS Baird and Girard.

Sceloporus graciosus BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, 1852, p. 69, pl. VII (Salt Lake), Type; Stansbury Great Salt Lake Exped., 1852, p. 346, pl. v, fig. 1.—COPE, Proc. Amer. Phil. Soc., XXII, 1885, p. 395.

Sceloporus gracilis BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, October, 1852, p. 75 (Oregon).—GIRARD, Herpt. U. S. Expl. Exped. (Ch. Wilkes), 1858, p. 386, pl. xx, figs. 1-9.—BOCOURT, Miss. Sci. Mex. Rept., 1874, p. 190, pl. XVIII, fig. 4.

Supraorbital region with a large crescent of transverse plates (much broken anteriorly) with a second smaller in its convexity. Two more external rows and an internal, making five in all. Cephalic plates smooth. Two middle verticals. Occipitals with a row of small, smooth plates behind. Free portion of hind toe reaching to middle of occipital. Dorsal and lateral scales equal, acute, rather spinous; about fifty rows of scales from head to tail. Femoral pores about fifteen.

Olive gray with two light lines on each side; scales wide, not margined by black, separated by eight rows of scales. Two series of elongated blackish crescents on each side the back. A vertical black line from dusky lateral bar on neck to shoulder, with a whitish one behind it. A bluish spot above insertion of arms. Two black lines on posterior face of tibia. Chin in male marbled with blue; sides with a blue patch separated below by seven or eight rows of scales.

Lateral gular flap very small, almost wanting; only indicated by the

small size of scales in the subjacent cavity. Occipital plate very large, subtriangular or pentagonal, broader than long, with three lateral plates, all quite small. The series of cephalic plates is occipital, 1, 1, 2, 3, and two or three smaller series to the nostrils. All are perfectly smooth. The supraorbital region shows one internal series of small plates, then a series of six or seven moderately broad ones, then two rather confused smaller series within the angular plates at the extreme outer edge.

The scales on the body are all small, there being, as far as can be ascertained, about fifty encircling the body at the thickest part. In a male about fifteen rows may be counted in the middle of the back in a space equal to the head in width; in a distended female only eleven. The scales on the tail are wider than those on the back. The scales

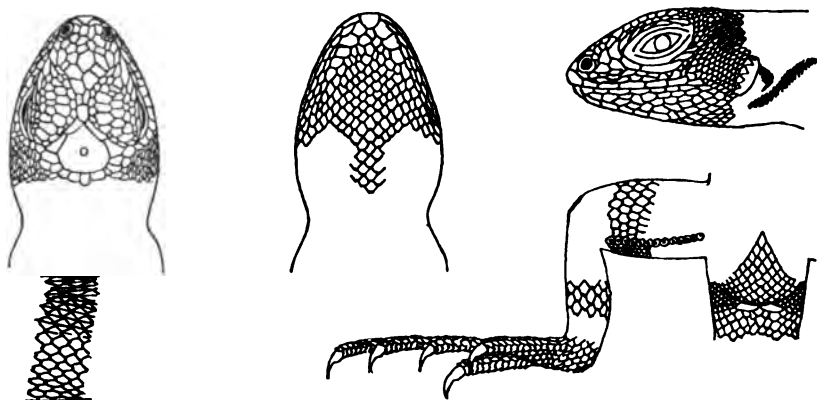


Fig. 63.

SCELOPORUS GRACIOSUS BAIRD AND GIRARD.

× 2.

Oregon.

Collection of E. D. Cope.

on the back are but little wider than those on the belly, certainly not one and a half times as wide. They are acute, conspicuously keeled, and mucronate behind, but with only slight indication of lateral notches, and that only close to the median point. The belly scales are very rarely notched, generally angular, but sometimes a little truncate. Those on the inside of the tibia and between the anal region are smooth. There are about fifteen femoral pores.

The ground color of this species is brownish; olivaceous above, with two conspicuous yellowish stripes on each side, the two inclosing a rather darker stripe, and the lower with a narrow interrupted dusky line below it. On each side are two series of U-shaped or crescentic dusky blotches, one between the light stripes, the other above the upper one. They are separated on the back by a plain grayish line, equal to the width of two (sometimes three) scales. They really begin

at the head as stripes, one behind the middle of the eye, the other in a line with the suborbital plates, but above the shoulder they break up into the crescentic blotches, of which there are nine or ten, to above anus. These blotches are formed by a U of black, the convexity behind, and the legs filled up by darker olive than elsewhere. They are bordered behind by narrow yellowish crescents, running into the lateral stripes. There is a round black spot immediately above the insertion of the arm on a line with the lowermost dark stripe, and a short perpendicular bar from the median dusky stripe on the neck to the shoulder; in the male running along the anterior face of the arm, but always separated from the black spot mentioned. There are two well-defined black lines on the posterior face of the thigh. The legs are barred with dusky, each bar bordered behind by yellowish. The under parts are yellowish white, the chin coarsely marbled or reticulated with bluish, sometimes greenish white. The tail is decidedly banded and blotched.

The male has an oblong blue patch on each side the belly, extending from (but not in) axilla to groin. The median light interspace is linear and about six scales wide. The upper series of blotches is contained in a width of about two and two half scales; the upper light line is about one and two half scales.

In some larger specimens from the upper Missouri (Cat. No. 2888) the dark crescents are more obsolete, and the blue on the side of belly is much darker internally, almost black, but does not extend on the anterior face of the thigh. In one specimen only, which appears to be very old and highly colored (Cat. No. 2842), the whole under surface of the femur is blackish, this color extending forward from the inner edge of the blue ventral blotches to the breast, separated there by a narrow light space from a blackish band across the throat. The space in front of the shoulder is black, with a white spot. The under surface of the head is blue, speckled with whitish, and faintly blotched with black.

The typical specimens of *S. gracilis* (Cat. No. 3063), from Oregon, I can not distinguish from those of *S. graciosus* except by the more obsolete nature of the markings. They appear rather more slender, but this may be owing to having been preserved in too strong alcohol. A specimen from upper Pitt River (Cat. No. 2832) appears precisely like Cat. No. 2888 from upper Missouri; like them, having the blotches less distinct than in the type specimens.

This species, though quite similar to *S. scalaris* of Wiegmann, is readily distinguished, with other features, by the smoothness of the cephalic plates, and by the definite direction of the scales of the sides of the body.

This is a pretty species, which is especially abundant in the Great Basin region. The most northern locality of its range with which I am acquainted is Summer Lake, Oregon, where I caught specimens. Stejneger records it from the Painted Desert, Arizona. I have observed a slight variety of it from near the city of Jalapa, Mexico, in the collection of the Comision Geographica et Exploradora of Mexico.

The following account of the habits of *Sceloporus graciosus* is given by Dr. Merriam in his report upon the results of the Death Valley expedition:

This species, which is a characteristic inhabitant of the Upper Sonoran and transition zones in northern Nevada, eastern Oregon, and Idaho, was very abundant on the sage-covered plateau of Mount Magruder at an altitude of 2,450 meters (8,000 feet); in the sage plains on top of the White and Inyo mountains near the boundary between California and Nevada; and on the east slope of the Sierra Nevada west of Owens Valley (at 2,450 meters, or 8,000 feet). It was common also among the sage and juniper on the Juniper Mountains, along the boundary between Nevada and Utah.

Sceloporus graciosus is generally found in company with such Transition zone species as the sage thrasher (*Oroscoptes montanus*), Brewer's sparrow (*Spizella brewerii*), the Nevada sage sparrow (*Amphispiza belli nevadensis*), the sage-plains chipmunk (*Tamias minimus pictus*), the sage-brush pocket mouse (*Perognathus olivaceus*) and the sage-plains spermophile (*Spermophilus mollis*).

Sceloporus graciosus Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2877	3	Salt Lake	Captain Stansbury	Alcoholic.
2881	1	.....	Dr. Gambel	do.
2888	5	Yellowstone, Nebraska	Colonel Vaughn	do.
3073	2	Oregon	Ex. Expedition	do.
2832	1	Upper Pitt River, Oklahoma.	Lieutenant Williamson	do.
2869	1	Sierra Nevada .....	.....	do.
2842	1	Salt Lake	Lieutenant Beck with	do.
2844	1	West of Rocky Mountains, Oklahoma.	Governor Stevens	do.
2881	1	Salt Lake, Utah	Lieutenant Beck with	do.
21168	1	Strawberry Valley, California.	Prof. C. H. Gilbert	do.
22587	1	Strawberry Valley, San Jacinto Mountain, Riverside County, California.	C. R. Orcutt	do.
8490	1	Abiquiu, New Mexico	Dr. O. Loew	do.
2877	5	Salt Lake, Utah	Capt. H. Stansbury, U. S. A.	do.
4978	3	Utah	C. McCarthy	do.
21478-9	2	Umatilla, Oregon	U. S. Fish Commission	do.

U. S. N. M. No.	Age and sex.	Locality.	Altitude.	When collected.	From whom received.	Nature of specimen.
18134	Female.	Mount Magruder, Nevada	<i>Feet.</i> 8,000	June 6	Merriam	Sage plain.
18135	Female.	.....	8,000	.....	do	do.
18136	Female.	.....	8,000	.....	Bailey	do.
18137	Male	Juniper Mountains, Nevada	6,700	May 19	Merriam	In junipers.
18138	Female.	Juniper Mountains, Sheep Spring, 15 miles east of Panaca, Nevada.	6,700	.....	Bailey	
18139	Male	High Sierra, west of Lone Pine, California.	8,000	June 18	Merriam	
18140	Female.	Panamint Mountain, Willow Creek, California.	6,400	May 12	Nelson	
18141	Male	(1)	(1)	(1)	(1)	(1) ¹

¹ Without a label, but with the following note by C. W. Richmond: "Received July 2, 1891, with specimens from Grapevine, Lone Pine, etc."

SCELOPORUS VANDENBURGIANUS Cope.

Sceloporus vandenburgianus COPE, American Naturalist, XXX, 1896, p. 834.

This is a small species with small scales and very dark colors. There is not much difference in the sizes of the dorsal, lateral, and ventral scales. Forty-five rows may be counted between the occiput and a line connecting the groins, and twelve in a head length. Between the groin and axilla thirty-five scales may be counted to an axillary area of smaller and smooth scales. The dorsal and lateral scales are keeled and mucronate; those of the inferior surfaces smooth and mostly feebly notched. Caudal scales strongly keeled and mucronate, and larger than dorsals. Two parietals on each side, the anterior the larger, and extending to the narrow marginal supraocular row, so that there is only one fronto-

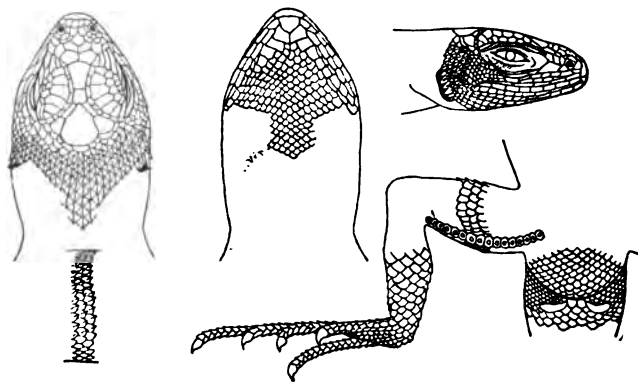


Fig. 64.

SCELOPORUS VANDENBURGIANUS COPE.

× 1.5.

San Diego County, California.

Cat. No. 21931, U.S.N.M.

parietal on each side. A third parietal external to the other two. The frontal is not longitudinally divided. There is one series of six large supraoculars, separated from the frontals and fronto-parietals all round by a series of small scales. External to the large supraoculars is a series of four much smaller polygonal flat scales much as in *S. biserialus*. Between these and the superciliaries is one row of still smaller scales (with an extra scale or two). Two scales on the canthus rostralis. Head scales all smooth. Six large free auricular scales. A single vertical prehumeral fold, inclosing a pocket of granular scales. Temporal scales keeled.

The extended hind leg reaches to the auricular meatus. Femoral pores 16. Male with postanal plates.

Color of adult male dark-green above, with faint traces of a paler stripe on each side of the back and of a few darker spots on each side of the middle line. Inferior surfaces dark blue, with a pale line in the

middle of the abdomen. Femur spotted with blue below; tibia and tail light-greenish below.

Measurements.—Total length, 127 mm.; length to vent, 57 mm.; length to line of axilla, 22 mm.; length to line of interparietal plate, 13 mm.; length of hind leg, 38 mm.; length of hind foot, 18 mm.; length of fore leg, 23 mm.; length of fore foot, 10 mm.

Sceloporus vandenburgianus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
21931	1	Summit of Coast Range, San Diego County, California.	Dr. E. A. Mearns.....	Alcoholic.

I have seen of this species only one specimen, which is an adult male. The colors of the female may be expected to be somewhat lighter. I have dedicated it to Mr. John Van Denburgh, of San Francisco, an able writer on herpetological subjects.

SCELOPORUS ÆNEUS Wiegmann.

Sceloporus æneus WIEGMANN, Isis, 1828, p. 370; Herpet. Mex., 1834, p. 50.—FITZINGER, Syst. Rept., 1843, p. 75.—BOCOURT, Miss. Sc. Mex., 1874, p. 205, pl. XVIII bis, fig. 4, 4a, 4b.—CORE, Proc. Amer. Phil. Soc., XXII, 1885, p. 394.

Tropidolepis æneus DUMÉRIL and BIBRON, Exp. Gén., IV, 1837, p. 309.—GRAY, Cat. Liz. Brit. Mus., 1845, p. 210.—AUG. DUMÉRIL, Cat. Méth. Mus. Hist. Nat. Paris, 1851, p. 78.

A small species with an arched profile. Supracephalic plates keeled, arranged as in *S. scalaris*, each canthus rostralis having two roof-shaped scutes; supraocular scales subhexagonal, in three rows, those of the internal row scarcely wider than long. The two frontals creased with a furrow; the posterior, nearly as large as the anterior, is articulated behind, along the shorter side, with the occipital plate. The latter, as wide as it is long, narrow in front, is bordered right and left by one or two frontoparietals and one parietal scute; behind, its outline is subround, showing in the middle a hollow in which is inclosed a small nuchal scale, a little larger than those on the upper part of the neck. Labial scales rectangular, eight above and ten below; above the upper ones there are two longitudinal series of lengthened scales. Anterior border of the ear bordered with scutella smaller than those which precede them. Dorsal scales not notched, rhomboidal, strongly keeled, sharply pointed, forming thirty-eight oblique series, from the nape of the neck to the posterior border of the thighs, eight longitudinal to the level of the shoulders, and twelve in the trunk region; eight of these scales equal the length of the top of the head; ventral scales and those of the sides rather small, the latter feebly notched, forming by the junction of their keels longitudinal lines parallel to those on the upper surface of the body. Tail scales smaller than those on the body, except

at the base, where they are of the same dimensions. Tibia not quite so long as the shielded part of the head. The femoral pores, less distinct in the female, number seventeen to eighteen under each thigh, and almost merge together at the interfemoral region.

Measurements.—Total length of specimen, 104 mm.; length of upper surface of head, 9 mm.; length of head at the level of the temples, 85 mm.; length of body from chin to anus, 44 mm.; length of tail, 60 mm.; length of tibia, 9 mm.

Upper surfaces of the body olive green, mixed with a coppery reddish brown; two indistinct bands extend along each side of the body; between each two there are traces of black dots. Lower surfaces bright yellow.

Says Bocourt: "Wiegmann's type of this species is a female of small size, resembling *Sceloporus scalaris* in the following particulars: (1) arrangement of supra-cephalic plates; (2) scales on the sides have the carinæ directed backward, forming by contact longitudinal lines parallel to those of the dorsal scales; (3) femoral pores merge together in the interfemoral region. There are some details, however, of no great specific value, which distinguish *Sceloporus æneus* from its relatives; head and limbs relatively short; scales of the upper part of the body rather large, and the coloration differs markedly in some respects."

According to Dugès, the *Sceloporus æneus* is characteristic of the Texcocan district of the plateau. He records it from Guanajuato, Silos, Tupatáro, Lamora, and Chilcota.

SCELOPORUS GRAMMICUS Wiegmann.

Sceloporus grammicus WIEGMANN, Isis, 1828, p. 370; Herpet. Mex., 1834, p. 51.—

FITZINGER, Syst. Rept., 1843, p. 76.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 192, pl. XVIII bis, fig. 12.—COPE, Proc. Am. Phil. Soc., XXII, 1885, p. 395.

Sceloporus pleurostictus WIEGMANN, Isis, 1828, p. 370.

Tropidolepus grammicus A. DUMÉRIL, Cat. Méth. Coll. Rept., 1831, p. 77.—GRAY, Griff. Cuv. Anim. King., IX, Syn., 1831, p. 43.—DUMÉRIL and BIBRON, IV, 1837, p. 308; Cat. Liz. Brit. Mus., 1st ed., 1845, p. 209.

Sceloporus heterurus COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 322.

Head shields smooth or slightly rugose, anterior frontal not divided; a series of feebly dilated transverse supraoculars, a series of large scales external to them; two canthal scales; occipital a little broader than long; parietals very small, usually one pair on each side; anterior border of ear feebly denticulated. Dorsal scales larger than ventrals, strongly keeled, not, or but slightly, mucronate, not serrate, in forty-five transverse rows between interscapular and sacral regions, forming oblique series; forty-five to fifty scales between the occipital shield and the base of the tail; twelve to fifteen scales correspond to the length of the shielded part of the head; lateral scales keeled, directed obliquely upward, gradually merging into the dorsals and ventrals; latter smooth, mostly entire; forty-six to fifty scales round the middle of the body. Caudal scales much larger than dorsals, with elevated keels, continued as ridges, in eighteen longitudinal rows, eight lines

beyond the vent. Male with enlarged postanal scales. Fourteen to seventeen femoral pores. The adpressed hind limb reaches the ear; tibia as long as the shielded part of the head; the distance between the base of the fifth toe and the extremity of the fourth slightly exceeds the distance between the end of the snout and the posterior border of the ear. Olive above, with transverse black spots; a narrow black scapular collar, interrupted medially; a longitudinal line in

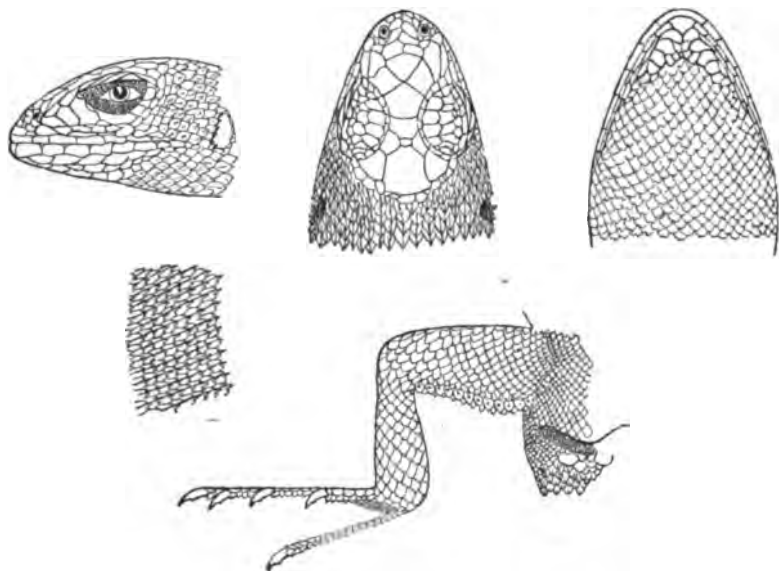


Fig. 65.

SCELOPORUS GRAMMICUS WIEGMANN.

Tehuantepec.

F. Sumichrath.

front of thigh; male with a blue, black-edged, elongated patch on each side of the belly.

Measurements.—From snout to vent, 40 mm.; head, 11 mm.; width of head, 8 mm.; fore limb, 18 mm.; hind limb, 26 mm. Reaches a size of 66 mm. from snout to vent.

This species is nearest the *S. microlepidotus* in affinity. It is not uncommon in Mexico. I have noted it from Yucatan, and Boulenger records it from Guatemala. Wilkinson sent it from Chihuahua, hence it comes within the scope of the present work.

SCELOPORUS MICROLEPIDOTUS Wiegmann.

Sceloporus microlepidotus WIEGMANN, Herpet. Mex., 1834, p. 51.

S. grammicus var. α , WIEGMANN, Isis, 1828, p. 370.—FITZINGER, Syst. Rept., 1843, p. 76.—BOCOURT, Miss. Sci. Mex. Rept., 1874, p. 194, pl. xviii bis, fig. 13.—COPE, Proc. Amer. Phil. Soc., XXII, 1885, p. 395.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 232.

Tropidolepis microlepidotus DUMÉRIL and BIBRON, Erp. Gén., IV, 1837, p. 307.—GRAY, Cat. Liz., 1845, p. 76.—AUG. DUMÉRIL, Cat. Méth. Coll. Rept., 1851, p. 77.

Sceloporus dispar BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 127.

Cephalic plates generally smooth, arranged very nearly as they are *S. variabilis* Wiegmann. Prefrontal scales rounded; two roof-shaped scales on each acanthus rostralis; occipital plate bordered posteriorly by a row of thick scales a little larger than those on the anterior part of the neck; supraoculars arranged in three longitudinal rows, sometimes in four or five, making a region of hexagonal scales rather wider than long; anterior border of the auditory meatus having a serrated structure, formed by flat-pointed scutella, slightly larger than those immediately preceding; scales on the back small, rhomboidal and keeled, arranged in from sixty-six to seventy-nine oblique rows extending from the nape of the neck to a line joining the posterior borders of the thighs; eighteen to twenty-one of the scales equals the length of the upper surface of the head; ventral scales and those of the flanks a trifle smaller; the keels of these latter scales are directed obliquely upward; tail covered with scutella, strongly keeled, as large again as those on the back; fifteen to twenty-two pores under each thigh.

Upper parts of the body olive green, with a very narrow collar and bands of striped brown, giving a mottled appearance to the flanks. On the lateral part of the belly the males have two longitudinal black bands, very close together, bordered on the outside with blue. The collar region is sometimes crossed with black; throat a blue gray, thickly dotted with small, black spots.

Measurements.—Total length, 140 mm.; length of head from the end of muzzle to the posterior border of the occipital plate, 14 mm.; width of head at the temples, 15 mm.; length of trunk from chin to anus, 61 mm.; length of tail, 79 mm.; length of tibia, 15 mm.

Sceloporus microlepidotus, regarded by Wiegmann in Isis as a variety of *S. grammicus*, differs from it only in having the dorsal scales smaller; but as these are variable in size in both cases, it is very difficult to distinguish always the species.

The *S. microlepidotus* is abundant on the Mexican plateau, ranging north to Guanajuato, where it has been taken by Dr. Dugès.

Locality.—South of Chihuahua. Donor, John Potts.

SCELOPORUS COUCHII Baird.

Sceloporus couchii BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 254.

Cephalic plates smooth. Supraorbitals in one large crescentic series, embracing a smaller one in its concavity; an internal and two external series in addition, the latter sometimes confused with the exterior central so as to have but two external to the large ones. Occipital very large, with large ones behind; one vertical. An anterior median pentagon surrounded by five plates. Dorsal and rump scales very small, smaller than caudal, but abruptly much larger than the entire lateral

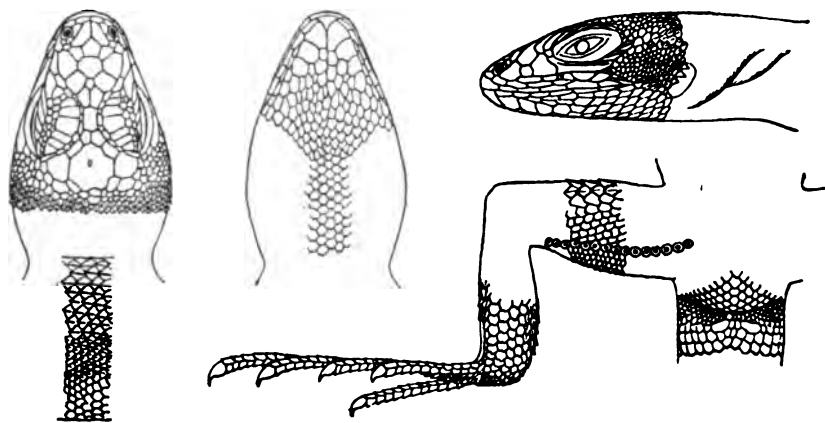


Fig. 66.

SCELOPORUS COUCHII BAIRD.

× 2.

Nuevo Leon.

Cat. No. 2739, U.S.N.M.

series; dorsal scales without mucro or denticulation; belly scales entire; about eighty-two series of scales from head to tail. Free portion of hind foot shorter than cephalic plates, in male longer than in female. Femoral pores about eighteen or twenty.

Above greenish olive, irregularly varied with small dusky blotches, with indistinct border behind lighter than ground color. Two lateral stripes separated by about eighteen rows of scales. Side of neck and body dark indigo; an oblique whitish stripe on sides from groin; a perpendicular bar above the shoulder and several light blotches on and in front of shoulder, circumscribing a subcircular indigo patch with a central blotch. Sides of jaws with blue and whitish bars extending round on the chin obliquely backward. Female almost plain greenish blue; whitish beneath.

This species, among those with the smallest dorsal scales, is also one of small dimensions. The head is depressed, rather pointed, but rounded at the tip, and the distance from snout to end of occipitals is

1½ the width above. The hind feet are lengthened, the free portion of longest toe being equal to or longer than the head above. The cephalic plates are all perfectly smooth, the anterior ones finely punctured round the circumference. The frontal is longitudinally divided. The interparietal is large and subquadrate or pentagonal and pointed anteriorly. There are two or three parietals on each side and a pair in contact anterior to this, then 1, 2, 3, 3 with three others to the plates surrounding the nostrils with four supranasals. The plates on the snout are so disposed anterior to the single internasal as to form a pentagon of five around a smaller. There are six transverse supraocular plates, with one internal and two external series, the latter sometimes indistinct.

The scales on the body are all very small, at least eighty or more encircling the body. They are not very acute, distinctly keeled above and on sides, with moderate scarcely projecting mucro. No lateral denticulations can be observed; the belly scales, however, are faintly notched. The scales on the sides are much smaller than those on the back, especially on the side of neck and above shoulders, where they are almost paved and tubercular, not imbricate.

The upper parts in the male are greenish olive, mottled irregularly with small blackish blotches, in which no serial arrangement can be observed. On each side of the back is a light-greenish line, the two separated by about eighteen rows of scales, exhibiting as many lines of carination nearly parallel to each other. Below this there is no distinct oblique serial arrangement of carinated scales, except midway between fore and hind legs. The sides immediately below the light stripe are abruptly bluish black, bordered posteriorly below by a well-defined white stripe passing obliquely upward and forward from the groin half way to the axilla, and then broken up the rest of the distance into a series of obsolete light mottlings and spots. Below this light space is an indigo patch on each side of the belly, quite obsolete and indistinct centrally and inferiorly, where there is an interval of eight or ten scales and no black inner margin, as in *variabilis*. The sides of the neck are deep indigo, with a distinct whitish band from the lateral stripe perpendicular to the insertion of the arm. Anterior to this is an angular light spot on the center of an indigo subcircular patch, bounded above and behind by the light lines mentioned, below by one or two yellowish spots. Anteriorly the sides of the neck are mottled with light spots and a yellowish horizontal line from the gape of the mouth. The sides of the jaws are crossed perpendicularly by five or six narrow light lines, which, on the chin, pass obliquely backward, so as, with their fellows, to form a series of indistinct and interrupted Vs, the intervals being blue. On the point of the chin, however, the whitish predominates. The posterior face of the thigh (covered with paved scales) is indigo, with a light stripe. The legs are banded transversely with dusky bluish.

This is the most highly varied of all the North American Scelopori,

and is very difficult to describe. It differs in coloration from its nearest ally, *S. marmoratus*, by the absence of serial arrangement of dorsal blotches; by the decided -shaped arrangement of the blue on the chin and the lines on the jaws; the white line on the flanks; the greater separation of the patches on the belly, and the absence of a dark inner border to them. The form differs very materially.

A young specimen (Cat. No. 2731a) has a more decided serial arrangement of larger and more quadrate dorsal blotches, and there is an indication of a dark blue patch on the throat, with a transverse whitish band connecting the yellowish patch on the shoulder.

In the four female specimens before me (Cat. No. 2743) the general color is of a light bluish; greenish olive above, and whitish beneath. There is a faint trace of ten dorsal rows of small crescentic blotches, and of a lateral light line, with a dusky stripe along the sides, but this is very indefinite. There is no decided indication of the usual blotches or lines about the shoulder.

This species is readily distinguished from most of its allies with small scales by the smoothness of the cephalic plates and the marked inferiority in size of the lateral to the dorsal plates. Those on the side of the neck and body for some distance behind the shoulders are almost like fine tubercles, not imbricated nor carinated.

I have referred Cat. No. 2739, males and females, to this species, although there is an unusual difference in color for the sexes of the same species and the hind toes are shorter. In coloration this is one of the handsomest of the genus.

Sceloporus couchii Baird.

Catalogue No.	Number of specimens.	Sex and age.	Locality.	When collected.	From whom received.	Nature of specimen.
2904	1	.....	Pesquera, Mexico....	— —, 1853	Lieut. Couch	Alcoholic.
2743	4	Female	Santa Caterina .....	.....	do	do.
2739	5	Male	do .....	.....	do	do.

SCELOPORUS CHRYSOSTICTUS Cope.

Sceloporus chrysostictus COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 125; Proc. Amer. Phil. Soc., XXII, 1885, p. 394.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 235.

Sceloporus cupreus BOCOURT, Miss. Sci. Mex., Rept., p. 210, pl. XVIII bis.

Near the *S. scalaris*, but without auricular marginal scales larger than the temporal, with smaller dorsal scales and different coloration. Lateral and ventral scales nearly equal; dorsals in forty-five rows from occiput to rump, obtusely mucronate, not notched. No larger plates behind parietals. Cephalic plates rugose; three pair supranasals; internasal small, flat; frontal nearly equally transversely divided, anterior half longitudinally divided. Interparietal narrowed anteriorly, long as broad; parietals oblique, longer than broad. Supraorbitals surrounded by marginals, the external separated from them by a row of rhombic

scales. Unguis of extended hind limb to near nostril. From end of muzzle to vent, 54.5 mm.

Brown, with two golden longitudinal lines from above ear to above groin, separated by nine rows of scales. A series of short, indistinct, reddish-brown crossbars on each side the dorsum within these lines. Sides darker, with golden spangles; axilla and scapular region black. Head dark brown; below, pale brown; chin darker.

This small species is widely distributed in Mexico. It was originally described from Yucatan, which is Tierra Caliente, but Dugès reports it from the elevated plateau of San Luis Potosi. I have it also from near the city of Guatemala from Van Patten.

Sceloporus chrysostictus Cope.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
2	Yucatan	A. Schott	Alcoholic.
1	City of Guatemala	Dr. Van Patten	do.

SCELOPORUS VARIABILIS Wiegmann.

Sceloporus variabilis WEIGMANN, Herpet. Mex., 1834, p. 51.—FITZINGER, Syst. Rept., 1843, p. 75.—BOCOURT, Misc. Sci. Mex., Rept., p. 200, pls. XVIII bis, fig. 1; XIX, fig. 2.—COPE, Proc. Amer. Phil. Soc., XXII, 1885, p. 394; Proc. U. S. Nat. Mus., XI, 1888, p. 397.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 236.—STEJNEGER, Proc. U. S. Nat. Mus., XIV, 1891, p. 485.

Tropidolepis variabilis DUMÉRIL and BIBRON, IV, 1837, p. 308.—GRAY, Cat. Liz. Brit. Mus., 1845, p. 209.—AUG. DUMÉRIL, Cat. Méth. Mus. Hist. Nat., 1851, p. 77.

Sceloporus marmoratus HALLOWELL, Proc. Acad. Nat. Sci. Phila., VI, 1852, p. 178 (San Antonio); Sitgreaves Report, 1853, Reptiles, p. 112, pl. II.

Sceloporus delicatissimus HALLOWELL, Proc. Acad. Nat. Sci. Phila., VI, 1852, p. 178 (San Antonio); Sitgreaves Report, 1853, Reptiles, p. 109, pl. I.

Sceloporus scalaris COPE, Bull. U. S. Nat. Mus., No. 17, 1880, p. 17, not of Wiegmann.

Supraorbitals in one large series with one internal and two external. One frontal plate; anterior to this, a central plate surrounded by five others. Occipital plates margined behind by smaller ones. Cephalic plates all strongly corrugated. Dorsal scales in seventy series, from head to tail; about forty-five from gular fold, smaller than caudal, larger than lateral; pointed with moderate mucro, but no lateral denticulations. Free part of hind toe as long as cephalic plates. Scales of sides of neck much smaller than on neck above. Femoral pores eleven.

Dark green above with two lateral light-greenish bands on each side, separated by about fourteen rows. Back with two series of subquadrate blotches separated by light lines confluent with the lateral. Sides dusky. A short, light line from the lateral stripe running perpendicularly to the insertion of arm. A black ellipse on each side extending as far as in axilla to the light line just mentioned; the outline interrupted above; the two in contact on the middle of the belly.

The plates on the upper surface of the head are all conspicuously and strongly rugose or wrinkled longitudinally. The cephalic plates, however, do not appear to differ materially from those of *S. graciosus*. The occipital is large and subtriangular, with three nearly equal plates on each side, the anterior pair in contact. Next comes one median plate, then two, then three, but with a small plate between the two series and surrounded by the five composing them. The six large supra-orbitals are bordered internally by one row and externally by two of small plates.

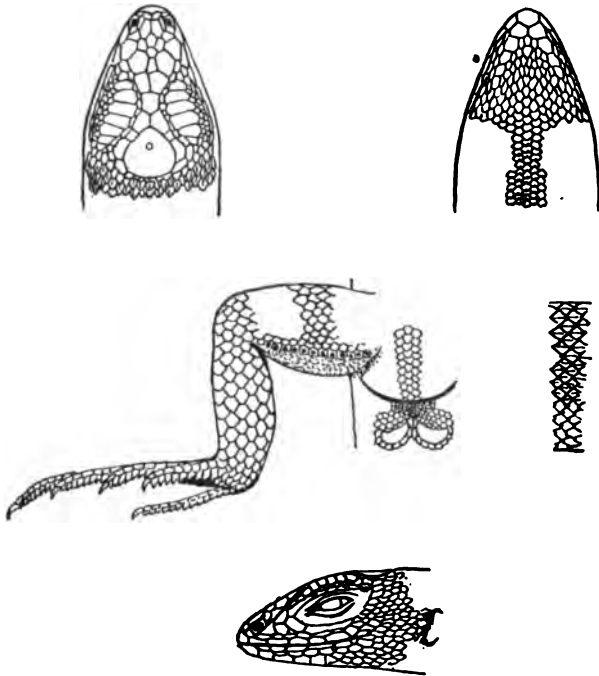


Fig. 67.

SCELOPORUS VARIABILIS WIEGMANN.

× 4.

Cat. No. 15655, U.S.N.M.

The scales are all very minute, much larger on the body than tail, scarcely largest above, those on the throat being scarcely distinguishable. There are at least seventy in a series around the middle of the body and about eighteen between the axillæ beneath. Those above and on the sides are very distinctly keeled and angular, with a decided mucro and lateral notch. The belly and chin scales have all a decided central notch but no carination, and the scales on the inner face of the tibia and postanal space are perfectly smooth. The hind feet are very long, the free part of longest toe equaling the head from nose to end of large occipital plate behind and nearly to ear. There are eleven or twelve femoral pores.

The lateral gular folds are quite moderate. The scales above are remarkable for being longer than broad. They are thus very acute-angled, decidedly keeled, and sharp, but with little or no projecting mucro. They are notched on each side the point above, very few of them on the belly, more on the chin. There are about thirty-nine or forty scales encircling the thickest part of the body. The legs are very short; the hind feet only about one and one-fourth times the head from snout to end of occipital plates. The scales on the inside of tibia and behind anus are smooth. There are about fourteen femoral pores.

The colors resemble much those of *S. graciosus*. The ground color above is olivaceous gray. There is a well-defined and narrow line of

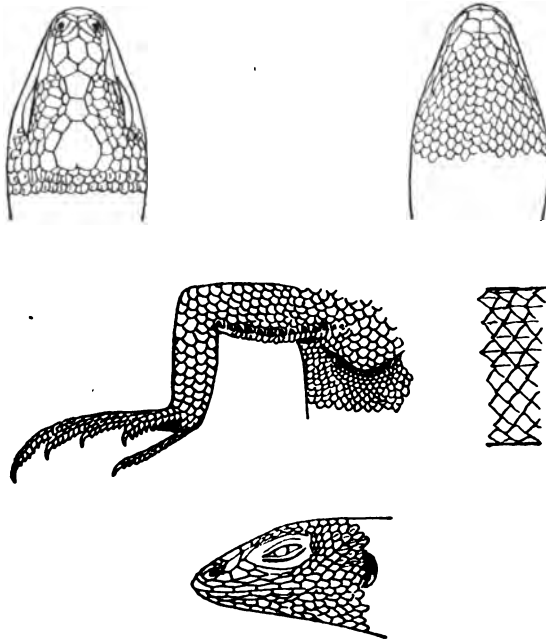


Fig. 68.

SCELOPORUS SCALARIS WIEGMANN.

× ½.

Cat. No. 2384, U.S.N.M.

yellowish white on each side the back, beginning distinctly on the temples in a line with the superciliary ridge. This occupies the center only of a single row of scales, the outer portion of which, and to a certain extent the inner also, is traversed by a well-marked line of black. These lines are separated on the back by six rows of scales. A central light, ashy stripe one and two half scales wide traverses the back, and on each side of these is a series of U-shaped blotches (about fifteen from head to above anus), bordered externally by the light lines. There is a second series of U's on the side, bounded below by a second interrupted yellow line on the adjacent half rows, the upper one being

the third from that traversed by the first-mentioned yellow line. There are even obscure indications of a third lateral series of dark blotches below this last line. On the back, where most distinct, the U-marks (the convexity behind) have their outline black, bordered behind by whitish (on the tips of scales), the interior filled up first by olive brown and then by gray. The lateral series are somewhat similar, the lower light line being formed by light borders to adjacent U-shaped blotches of the second and third series. There is a V-shaped mark on the occipital region, the angle anterior, and another behind the nostrils, with an intervening blotch and a transverse bar on the superciliary region. There is a short line above the insertion of the arm and another on the shoulder below it, but no trace of a short perpendicular line. The under parts are uniform whitish. The specimen is a female and lacks the blue of the chin and sides.

This species has the general appearance of *S. graciosus*, but has the scales above much larger and more elongated. The upper light yellow lines are narrower and more sharply defined, being on one row of scales, separated by six or seven scales, instead of on one and two halves, separated by nine or ten. The U-marks are better defined. There is no trace of the short perpendicular black bar in front of the shoulder and little of the two on the posterior face of the thigh. The U-marks on the head are peculiar. The head is narrower; the plates anteriorly more symmetrical, and decidedly wrinkled instead of small. The feet are much shorter.

From *S. consobrinus* it differs in the U-shaped marks on the back, the very narrow light lines on the middle of one row instead of on the adjacent edges of two, the rugose plates of the head, the weak feet, the elongated thin scales.

Sceloporus scalaris Wiegmann.

Catalogue No.	Number of specimens.	Locality.	From whom received.
8329	1	Between Chihuahua and City of Mexico.....	John Potts.

PHRYNOSOMA Wiegmann.

Phrynosoma WIEGMANN, Isis, 1828, p. 367; Herpet. Mex., 1834, p. 52.—WAGLER, Syst. Amph. 1830, p. 145.—DUMÉRIL and BIBRON, Erp., Gén. IV, 1837, p. 311.—FITZINGER, Syst. Rept., 1843, p. 78.—GRAY, Cat. Liz., 1845, p. 227.—GIRARD, U. S. Expl. Exp. (Ch. Wilkes); Herpet., 1858, p. 388.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 231.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 239.

Batrachosoma FITZINGER, Syst. Rept., 1843, p. 79.—GIRARD, U. S. Expl. Exp. (Ch. Wilkes), p. 400.—BOCOURT, Miss. Sc. Mex., p. 259.

Tropidogaster FITZINGER, Syst. Rept., 1843. (Not of Duméril and Bibron.)

Anota HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1852, p. 182.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 230.

Tapaya GIRARD, U. S. Expl. Exp. (Ch. Wilkes), p. 394 (not of Fitzinger).—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 220.

Tympanum more or less distinct. Body depressed, without dorsal crest; dorsal lepidosis heterogeneous. Head covered with small scales, bordered posteriorly by osseous spines. A transverse gular fold. Digits with keeled lamellæ inferiorly. Femoral pores. Tail short. Lateral teeth subconical or indistinctly tricuspid; no pterygoid teeth. A large sternal fontanelle. No abdominal ribs.

This peculiar genus ranges over the Central, Pacific, and Sonoran districts of Nearctica, and the political State of Mexico. It represents the extreme of the terrestrial habit in the Iguanidæ, corresponding in this respect to *Phrynocephalus* and *Moloch* among the Agamidæ. The latter it resembles in the horny processes of the skull and heterogeneous pholidosis, flat and spinous scales being mixed. The body is very flat, and this form can be increased at the will of the animal by the extension or abduction of the ribs which extend the abdominal border. In defense the muzzle is depressed and the horns elevated, as in Mammalia with posterior horns; the back is also arched. Some of the species are said to eject a bloody fluid from the eyes at such a time, but this I have not observed. In life their horns constitute their only defense, as they possess no speed. They are, however, abundant in the dry regions of the southwest, where enemies are few, and where they can take refuge beneath the formidable spines of the Agaves and Yuccas, and the prickles of the Opuntias. They can not be an attractive mouthful to snakes, and I once saw a dead rattlesnake with the horns of a *Phrynosoma* which it had swallowed penetrating the neck through the upper integument, one on each side of the vertebral column. In confinement *Phrynosomas* can seldom be induced to eat, and they frequently lay eggs.

Osteology.—The following account of the osteology is derived from the skeletons of three species, *P. douglassii*, *P. cornutum*, and *P. coronatum*. The description applies equally to each of these species unless otherwise stated:

The premaxillary has a very short alveolar portion which does not bound the nostrils below (or very little, *P. coronatum*). It has a superior spine and concave palatal border. The nasals are distinct and are excavated in front by the large narial openings. The frontal is single, is much narrowed in front by the prefrontals, but extends transversely posterior to the orbits, where it sends forward an acute process in the superciliary angle. The prefrontal is large and extends posteriorly to or beyond the middle of the supraorbital border. It sends posteriorly an acute superciliary process, which meets that of the frontal from behind, over the eye in *P. cornutum*; does not quite meet it in *P. coronatum*, and fails to meet it by a longer interval in *P. douglassii*. The lachrymal is small and is not reached by the anterior angle of the jugal. The parietal is broad and short, and the pineal foramen pierces it at the coronal suture. Its lateral border is very little decurved to meet the petrosal.

Its strong parietoquadrate arch supports a horn or tuberosity, and in most of the species the middle of the posterior border supports the same. The occipital is broadly articulated with the parietal in *P. douglassii* and *P. coronatum*; in the former loosely, in the latter closely. In *P. cornutum* it affords a narrow but firm support for the parietal. Paroccipital small, visible from behind. The postfrontal is visible as a rudiment in *P. douglassii*, but it is apparently coossified in the other two species. The postorbital is slender, expanding below for union with jugal and supratemporal. The former bears two sharp tuberosities in *P. coronatum*, and the supratemporal two. In *P. cornutum* there is none on the jugal, but there are three on the supratemporal; and in *P. douglassii* the arrangement is similar. Owing to the inferior position of the supratemporal, the quadrate is oblique forward and downward. It presents one conch, the external. The vomers are short, and are separated from each other for the posterior half or more of their length by a hiatus, which continues posteriorly of about equal width between the palatine and pterygoid pairs. The latter are short, wide, and flat, and the palatine foramen is small; least and oval in *P. coronatum*; small and round in *P. cornutum*; larger and elongate in *P. douglassii*. The ectopterygoid is decurved at its inner extremity. The presphenoid is wanting, and the suture between the sphenoid and the basioccipital is persistent. The supraforaminal part of the petrosal is very short, and the infraforaminal part is not much produced, and has a wide inferior groove. The epipterygoid originates behind the ectopterygoid process, and has the peculiarity among Iguanidæ of not reaching the parietal, but of resting on the anterior border of the petrosal. The occipital condyle shows traces of its tripartite composition. The postoptic is curved and simple and does not reach the frontal bone. The latter is grooved on the middle line below.

The groove of Meckel's cartilage is open throughout in *P. cornutum* and *P. coronatum* and distally only in *P. douglassii*. The coronoid is not produced horizontally on the external face of the mandible, and the dentary is not produced beyond its posterior border. This element has a reflected inferior border in the *P. cornutum* which is acutely dentate posterior to the middle, characters absent from *P. coronatum* and *P. douglassii*. In *P. douglassii* the surangular is not coossified with the articular, while it is so united in the other two species. The angle is short, and is directed downward and obliquely inward.

The basihyal is wide and is ossified, and the second ceratobranchials are very short and widely separated. The hypohyals are short and carry the ceratohyals on their extremities. No expansions of lateral elements.

The vertebrae have no zygosphen articulation, but the prezygapophyseal facet is carried upon the side of the neurapophysis at an angle with the usual position. This furnishes the initial step in the production of a zygosphen. I find five cervical intercentra in *P. cornutum* and *P.*

coronatum, and six in *P. douglassii*, exclusive of the intercentrum of the atlas, which has no hypapophysis. Ribs extend to the sacrum, and are attached to very short diapophyses. The two sacral diapophyses are separated by a wide fissure in the *P. coronatum* and *P. douglassii*, but are closely appressed in *P. cornutum*. On one side of the skeleton of *P. douglassii* the last lumbar vertebra carries, abnormally, a third sacral diapophysis which reaches the ilium. Proximal part of caudal vertebrae with long diapophyses. Caudal centra not segmented. Chevron bones intercentral, *not uniting distally*. Neural spines everywhere very low, those of the caudal vertebrae single.

The suprascapula is exceptionally elongate, and the scapula is of moderate length and has a proscapular process. The coracoid has one emargination. The interclavicle is remarkable for the shortness of its posterior limb, which is shorter than the transverse limb in *P. cornutum* and *P. douglassii*, and equal to it in *P. coronatum*. The sternum has a very large fontanelle which approaches the posterior border. In *P. coronatum* and *P. douglassii* three ribs articulate with the sternum, but in *P. cornutum* two only in my skeleton. The xiphoid rods are widely separated, and carry but one rib.

The ilium has a short *angulus cristæ*, and the acetabulum is entire. The pubis and ischium are slender and transverse in position, and approach nearly at their symphyses, which are connected by a short, narrow cartilage. The pectineal process is obsolete, while the tuber ischii is a prominent angle.

Two peculiarities especially distinguish this genus among Iguanidæ: First, the connection of the epipterygoid with the petrosal, and, second, the absence of symphysis of the chevron bones. The characters of the sternum are an extreme of what is seen in *Sceloporus*.

Viscera.—The distinction between the large and small intestine is well marked, and there is a large colon, which is set off from the rectum by a strong constriction. The liver is large, and extends farther posteriorly than in any genus of Iguanidæ. The left lobe is larger than in any other genus, extending in most species as far posteriorly as the much narrower right lobe. The posterior border is deeply excavated between them. The mesenteries are of the usual type, except that there is a right hepatovenral in addition to the usual one. It has a position so far to the right side as to be as well termed a hepatolateral. The usual hepatovenral, in consequence of the elongation of the left lobe of the liver, which it follows, extends to or nearly to the transverse or cystic mesenteric fold.

The penis in *P. asio* is short, and terminates glans-like, in which the rims of opposite sides turn inward toward the obtuse apex on one side. As they turn inward they become separated from the remainder of the glans by a groove, which becomes deep and defines a median lobe between them, which forms the apex of the organ. The grooves do not continue on the side opposite to that on which they originate. The surface of the organ is deeply longitudinally plicate, but at the apex

of both lateral and median lobes the plicæ inosculate, forming a tripe-like structure.

Species.—I distinguish eleven species of this genus, which differ as follows:

I. One series of marginal abdominal scales.

a. No enlarged gular scales.

b. Nostrils in line with canthi rostrales.

Horns reduced to tubercles, the temporals larger than occipitals; infra-labials and enlarged dorsal scales not prominent; ventrals smooth.

P. douglassii Bell.

Horns short, occipitals longer than temporals in the same plane; infra-labials not prominent; large dorsals not prominent; ventrals smooth.

P. orbiculare Wiegmann.

Horns short, occipitals longest, directed upward and not in plane of temporals; infralabials not prominent; large dorsals prominent.

P. boucardii Bocourt.

aa. Enlarged gular scales present.

b. Nares within canthi rostrales.

A single large temporal horn on each side; occipitals rudimental; ventral scales keeled; tail very short..... *P. taurus* Dugès.

Three temporals and the occipital subequal; ventral scales keeled; tail very short..... *P. braconnerii* Bocourt.

bb. Nares on line of canthi rostrales.

Occipitals longest; temporals prominent; the anterior below the orbit; ventrals smooth; enlarged dorsals prominent; enlarged gulars in several rows; a subtrical spine; two rows of marginals on the tail.

P. cerroense Stejneger.

II. Two marginal abdominal fringes of elongate scales.

a. Enlarged gulars present; enlarged dorsals prominent.

b. Nares within canthi rostrales.

Ventral scales smooth; four equal elongate occipital horns, forming with the temporals an uninterrupted series; inferior marginal abdominals feeble; one row of enlarged gulars..... *P. solare* Gray.

Ventral scales smooth; posterior temporal and occipital turned outward; anterior temporal below eye; a subtrical not followed by a spine; several rows of enlarged gulars; a median occipital spine.

P. coronatum Blainville.

Ventrals generally keeled; occipitals directed upward, the median minute; temporal row posterior only; no subtrical; one row of enlarged gulars..... *P. cornutum* Harlan.

bb. Nares on line of canthi rostrales.

Ventrals smooth; occipitals and last temporals subequal, straight; temporal row, but no horn under eye; median occipital minute; a subtrical followed by a spine; several rows of enlarged gulars.

P. blainvillei Gray.

Ventrals keeled; superciliaries, last temporals, and occipitals subequal, the last directed upward; no median occipital; temporal row not extending below orbit; no subtrical; several rows of enlarged gulars; enlarged dorsals prominent at the sides of the back only... *P. asio* Cope.

These species may be also grouped as follows, by consideration of certain characters of the squamation:

I. Several subtrical projecting plates; temporal row of conic plates not continued to below orbit. Large dorsal scales without rosette at base. Two occipital horns. Femoral pores in the interior of scuta.

P. orbiculare; *P. douglassii*; *P. boucardii*; *P. braconnerii*.

- II. One large subtrical projecting plate; temporal row of conic plates continued to below orbit; dorsal scales without basal rosette. Femoral pores on borders of scuta. Two occipital horns *P. coronatum*; *P. cerroense*; *P. blainvilliei*.
- III. No subtrical prominent scale; temporal row not continued to below orbit; four occipital horns; large dorsal scales generally without rosette; femoral pores in interior of scuta..... *P. solare*.
- IV. No subtrical prominent scale; temporal cones not continued to below orbit; large dorsal scales with basal rosette; one occipital horn; femoral pores at margins of scuta..... *P. cornutum*; *P. asio*; *P. taurus*.

The attempt has been made to define more than one genus from the characters presented by the above species. One of the characters viewed as indicating this result is the varying position of the nostrils as regards the canthus rostralis. On this basis the *P. coronatum* might be as readily referred to one division as the other, as it is in this respect exactly intermediate. Such a division would violate the affinities expressed in the second table. This is, however, not an insuperable objection, as allied genera not infrequently possess parallel series of species.

The largest species is the southwest Mexican *P. asio*. It is remarkable for the reduction of its temporal horns to two on each side, and the large size of its superciliary horns, which equal the posterior temporal and occipital in length. The *P. taurus*, from southeastern Mexico, is remarkable for the presence of only one temporal spine, which is very large, and the abortion of all the other spines, of which the occipital are represented by rudiments. Eleven species are known, three being restricted to the tropical parts of Mexico, namely, *P. asio*, *P. taurus*, and *P. braconnerii*.

Habits.—Under the head of *Phrynosoma douglassii*, Dr. Stejneger¹ thus writes of the metachrosis, which is so observable in this genus:

Much has been written in regard to the perfection with which these animals "imitate" the color of the ground on which they live, and our own observations fully verified the statement that they afford one of the most striking examples of protective mimicry.

In the cedar and pine belts of the San Francisco Mountain the dark color of the soil and stones covering the surface is closely matched by the ground color of the *Phrynosomas*, while the greenish gray and orange colored markings, which somewhat irregularly adorn their backs, are perfect imitations of the lichens covering the rocks and pebbles among which these odd-looking creatures live. Near the rim of the Grand Canyon of the Colorado, on the other hand, the ground is covered with small pebbles of variously colored sandstone, ranging from a clayey white to brick red and dark brown, and the specimen which I collected there (No. 15724) is such a faithful reproduction of the surroundings that it would undoubtedly have remained undetected had it not been moving. Even more remarkable are the specimens which Dr. Merriam collected in the black lava belt, east and northeast of the mountain. One of these (No. 15815) was brought to camp alive, enabling me to make the following description of the fresh colors: "Ground color of upper side, including head, satiny black; light markings on median third of body dull 'Naples yellow,' abruptly changing into the yellow ochre of those on the sides; tips of most lateral spines

¹North American Fauna, No. 3, 1890, p. 114.

white; tips of largest cephalic spines marbled with ocher; underside yellowish white, densely marbled with blackish; collar, light ocher yellow." In these specimens even the gloss of the black lava was imitated.

PHRYNOSOMA DOUGLASII Bell.

Phrynosoma douglasii WAGLER, Syst. Amph., 1830, p. 146.—WIEGMANN, Herpt. Mex., 1834, p. 54.—HOLBROOK, N. Am. Herpet., II, 1842, p. 101, pl. XIV.—GIRARD, Stansbury Expl., 1852, p. 362, pl. VII, figs. 6-9.—COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 302.—COUES, Wheeler's Report Expl. W. 100th Mer., V, 1875, p. 591.—GRAY, Synopsis, Rept. Griff., Cuv. Anim. Kingd., IX, 1831, p. 44; Cat. Liz., 1845, p. 227; Zool. Beechey's Voy., 1839, p. 96.—DUMÉRIL and BIBRON, Erp. Gén., IV, 1837, p. 323.—FITZINGER, Syst. Rept., 1843, p. 78.—BOULENGER, Cat. Liz. Brit. Mus., 1885, p. 240.

Agama douglassii BELL, Trans. Linn. Soc., XVI, 1833, p. 105, pl. x.—HARLAN, Med. and Phys. Res., p. 141, plate, fig. 3.

Phrynosoma orbiculare HALLOWELL, Sitgreaves Exped. Zuni and Colo. River, 1853, p. 125, pls. VIII, IX.

† *Tapaya hernanderii* GIRARD, U. S. Expl. Expd. (Ch. Wilkes), Herp., 1858, p. 395; U. S. and Mex. Bound. Survey, 1859, p. 8.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 228.

Tapaya brevirostris GIRARD, U. S. Expl. Expd. (Ch. Wilkes), Herp., 1858, p. 397.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 229.

Tapaya douglassii GIRARD, U. S. Expl. Expd. (Ch. Wilkes), Herp., 1858, p. 397, pl. XXI, figs. 1-5.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 226, pl. XI, fig. 5.

Phrynosoma brevirostre COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 302.

Outline of head from above, parabolic; profile of muzzle descending steeply and convex to a projecting lip border. Temporal region wide, but not especially expanded. Nostril in the line of the canthus rostralis. Horns represented by conical protuberances on each side. Three temporals and one occipital, of which the occipital is about as prominent as the second temporal and less so than the third temporal. Occipitals widely separated at base. The temporal row of scales is continued to below the orbit, but the latter are not prominent. Scales of vertex convex, rugose; occipital and two posterior to it, with one within and adjoining the posterior superciliary, a little larger than the others. Six posterior inferior labials enlarged, the most posterior with produced angles, forming a series of subrials. One series of enlarged infralabials, which are not so prominent and do not extend as far posteriorly as the subrials. Two short oblique rows of conic scales on the side of the neck, the superior the longer. Two large scales in vertical relation behind nasal, and separated from it by a row of smaller scales. A small keystone superciliary. Gular scales rounded, smooth.

Median dorsal scales flat, keeled, of irregular sizes, but not so large as in the species of the *cornutum* or *coronatum* groups. Lateral dorsal scales rounded, smaller, but not so small as in the *coronatum* group. The large isolated keeled scales are less conspicuous than in the other groups and are in about four rows on each side. They are not surrounded by a rosette at base. A single series of moderately elongate closely placed marginal scales, commencing anterior to the groin and

terminating above posterior to the axilla. A single prominent scale above the humerus. A series of conic scales on each side of the tail, which are not so prominent as the large keeled spinous scales which project from among the flat ones of its superior surface. Superior face of arm and cubitus covered with large acute keeled scales; of leg and thigh with smaller scales, among which large prominent keeled and spinous scales are mingled. Scales of inferior surfaces smooth, except those of the distal part of the cubitus, the distal half of the tail, and of the palms and soles, which are keeled. Lateral digital scales not produced.

The legs are shorter than in any other North American species, the posterior ones when extended reaching barely three-fourths the distance to the axilla. The tail varies in length in the subspecies from about twice the head in the typical form to more than three times in the subspecies *hernandesii*. Femoral pores, sixteen on each thigh, the series approaching but not meeting on the middle line.

Measurements.—Total length, 111 mm.; length to vent, 80 mm.; length to gular fold, 19 mm.; length of head with occipital horn, 19 mm.; length of head without a horn, 17 mm.; width at temporal region, 23 mm.; length of fore leg, 32 mm.; length of fore foot, 11 mm.; length of hind leg, 40 mm.; length of hind foot, 19 mm.

The ground color of the superior surface of this species is variable and under the control of the animal in a large degree. It may be pale, ashy, brown, reddish, or nearly black. There is no distinct vertebral stripe. There is a large dark nuchal spot on each side and three double dorsal spots on each side of the body. These spots may be separate or fused, in the latter case forming a cross band with posterior bilobate outline. They are ill defined anteriorly, but posteriorly they are well defined, and frequently have a pale or even bright colored border. Tail and limbs obscurely cross-banded above; head uniform brown. Inferior surfaces uniform cream-colored, unspotted, except on the gular region, where small black spots are frequently present. The small cranial horns are frequently pink.

This species has much the most northern range of all the *Phrynosomas*, inhabiting Oregon, parts of Washington, and Montana. To the eastward it extends into Montana, Nebraska, and Kansas, and to the south to Socorro, New Mexico, and middle Arizona. It does not occur in Texas, so far as known. It is thus especially characteristic of the central region and the northern part of the Pacific. Within this range it presents three modifications. Specimens from the northern Pacific region are of smaller size than those from the Central region, and the tail is short; a larger brighter-colored and also short-tailed form from the deserts of the great basin, and a larger and long-tailed form from the Rocky Mountain region and eastward.

Dr. Elliott Coues thus describes the habits of this species as observed by him:¹

Like other species of the same genus, this *Phrynosoma* is slow of foot and readily captured; it makes an interesting pet to one fond of observing the traits of lower animals. It may readily be secured by a thread tied behind its "horns," and in this state of partial liberty its habits may be studied to advantage. It is one of the most inoffensive and amiable of reptiles, though some of the largest and boldest individuals sometimes make a slight demonstration in self-defense by biting weakly. It usually submits at once without remonstrance. When handled, it has a way of making itself perfectly flat, when, closing its eyes, it will simulate death in this collapsed state. Under some circumstances it will swell up the body prodigiously till it assumes a nearly spherical shape. It has a sly way of watching for a chance to escape by bolting away when it thinks itself unobserved, and a still more curious knack of burying itself in sand or other loose soil. This is accomplished by a gradual lateral and forward insinuating wriggling of the body, with the muzzle pointed downward and the limbs drawn close to the sides. A few moments suffice for its disappearance. A certain slight means of defense which the "horns" may sometimes afford is shown by the use they are put to when the animal is irritated by poking with a finger or bit of a stick; then the head is lowered, the horns set forward, the back arched up, and the whole attitude becomes ludicrously like that of a bull in miniature. The horned lizards show special aversion to dogs. On approach of one they raise themselves to the full length of the legs, puff out the body, open the mouth, and hiss audibly, altogether presenting quite a formidable front. Their food, in confinement and otherwise, consists chiefly of flies and other insects, which they capture by a quick thrust of the fleshy tongue, lubricated with viscid saliva. I have not observed the time of coition nor the period of gestation, but most of the females are found pregnant in July, and the young appear in great numbers in August. The male is usually smaller than the female and of slenderer form.

The varieties of this species have been distinguished by Girard as species, and they have been thus defined by Stejneger:²

Size small; horns rudimental; tail short; colors obscure..... *P. d. douglassii*.
 Size larger; median horns directed posteriorly; tail longer; body more spinous;
 colors obscure *P. d. hernandesi*.
 Size largest; median horns directed upward; colors more brilliant... *P. d. ornatissimum*.

An examination of a large series of specimens shows that the above characters define races which do not seem to me to be sufficiently distinct to represent subspecies. Thus the direction of the occipital horns is not constantly associated with other characters, and the length of the tail of some specimens and of *P. d. ornatissimum* is equal to that of some individuals of *P. d. hernandesi*.

PHRYNOSOMA DOUGLASSII DOUGLASSII Bell.

Phrynosoma douglassii douglassii STEJNEGER, N. Amer. Fauna, No. 3, 1890, p. 112.

Phrynosoma douglassii var. *B. exilis* COPE, Ann. Rept. U. S. Geol. Sur. Terrs., 1871, p. 46.

Phrynosoma douglassii BELL, var. Cope, Proc. Acad. Nat. Sci. Phila., 1883, p. 20.

Phrynosoma douglassii pygmaea YARROW, Proc. U. S. Nat. Mus., V, 1882, p. 443.

A small form not more than one-half or two-thirds the usual size, but nearly identical in details of structure and coloration, first described from Carrington's Lake, Montana; Fort Hall, Idaho. The differences

¹ Rept. U. S. G. G. Surv. W. of 100th Mer., V, Zoology, p. 592.

² North American Fauna, No. 3, 1890, p. 113.

observable are: The rather shorter muzzle, which is entirely vertical in profile; the smaller scales above the canthus of the mouth and temporal bones, the less prominence of the posterior superciliary angle, and the much reduced size.

On the elevated land which represents the Sierra Nevada Range, between Warners Lake and Goose Lake, in the basaltic region near the former, I found a peculiar variety of this species. The horns are

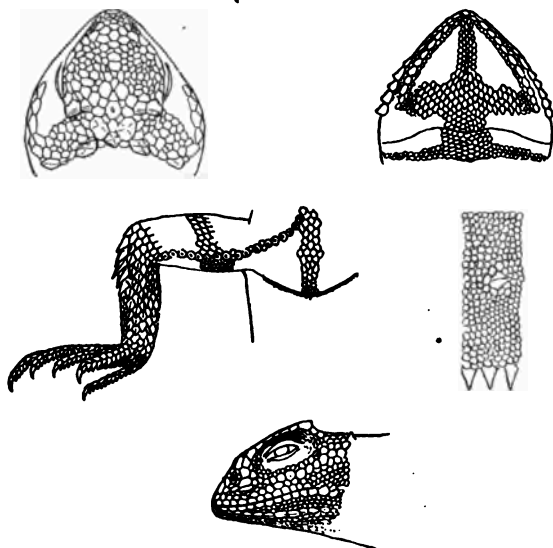


Fig. 69.

PHRYNOSOMA DOUGLASSII DOUGLASSII BELL.

× $\frac{1}{2}$.

Fort Walla Walla.

Cat. No. 10918, U.S.N.M.

even more rudimentary than in the usual form, but are all represented. The prominent scales of the back are smaller and less prominent. In some of the specimens the head is shorter relatively to the body. The color is an iron-rust brown, with darker lateral spots, each with a small posterior yellow border. Individuals are abundant; some of those taken are full of eggs. All are much smaller than *P. douglassii hernandesi*.

This form is confined to the northern part of the Pacific district.

Phrynosoma douglassii douglassii Bell.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
11473	2	Des Chutes River, Oregon	— —, 1878	H. W. Henshaw	Alcoholic type.
10918	6	Fort Walla Walla, Washington.	— —, 1880	Capt. Chas. Bendire, U. S. A.	Alcoholic.
11945	3	Oregon	— —, 1878	H. W. Henshaw	do.
14816	.....	Fort Verde, Arizona .....	.....	Dr. E. A. Mearns	do.
16315-17	.....	Near head of Birch Creek, Idaho.	.....	U. S. Department of Agriculture.	do.
16318-19	.....	Desert at Sink of Big Lost River, Idaho.	.....	do.	do.
21473	.....	Clear Water River, Idaho.	.....	U. S. Fish Commission ..	do.

PHRYNOSOMA DOUGLASSII HERNANDESI Girard.

Phrynosoma hernandesi STEJNEGER, N. Amer. Fauna, No. 3, 1890, p. 112.

Tapaya hernandesi GIRARD, U. S. Expl. Expd. (Ch. Wilkes), Herpt., 1858, p. 395; U. S. and Mex. Bound. Surv., 1859, p. 8.—BOCOURT, Miss. Sci. Mex., Rept., 1874, p. 228.

Tapaya brevirostris GIRARD, U. S. Expl. Expd. (Ch. Wilkes), Herpt., 1858, p. 397.—BOCOURT, Miss. Sci. Mex., Rept., 1874, p. 229.

Phrynosoma brevirostre COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 302.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 240.

Head broader than long, with the spines very small; nostril pierced in the line of the canthus rostralis; tympanum naked; the head spines,

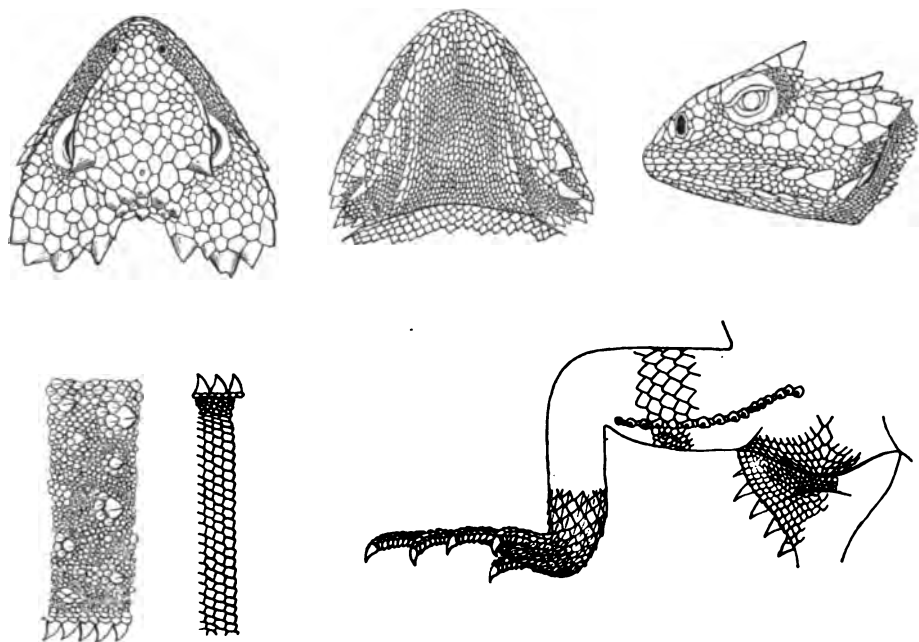


Fig. 70.

PHRYNOSOMA DOUGLASSII HERNANDESI GIRARD.

× ½.

Arizona.

Cat. No. 11858, U.S.N.M.

which are subequal, not, or but slightly, larger than the largest spinose scales on the body, and turned upward; they number on each side, one postorbital, one occipital, and three temporals; in very young specimens the spines are not distinguishable; lower labials terminating in a series of four or five large, compressed, obtuse, or pointed scales; a series of enlarged scales, as large or a little larger than, and parallel to, the lower labials; gular scales equal, smooth; gular fold strong; a dermal thickening, bearing a few small, erect spines, on each side, between the gular fold and the tympanum. Back and limbs with scattered, large, erect, keeled, spinose scales, which are longer than broad; a regular lateral

series of spines; pectoral and ventral scales perfectly smooth. Fifteen to twenty-one femoral pores on each side in the male, twelve to fifteen in the female, the series not joining medially. Male with enlarged post-anal scales. Tail twice to two and a half times as long as the head. Yellowish, grayish, or brownish above, with more or less distinct, large, dark, light-edged spots forming longitudinal and transverse series; lower surfaces whitish, uniform or scantily dotted with gray.

Measurements.—Total length, 94 mm.; head, 14 mm.; width of head, 18 mm.; body, 50 mm.; fore limb, 26 mm.; hind limb, 33 mm.; tail, 30 mm.

This is the form characteristic of the central district generally, and is found abundantly throughout the Great Plains and the Rocky Mountains.

Phrynosoma douglassii hernandesi Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
214	1	Oregon		U. S. Expl. Expedition	Alcoholic.
215	1	do		do	do.
216	6	(1)		Gov. Stevens	do.
217	1	Stellacoom		do	do.
218	1	West of Rocky Mountains		do	do.
219	3	Klamath Valley		Lieut. Williamson	do.
220	2	Klamath Lake		do	do.
221	1	Near Fort Benton		Gov. Stevens	do.
222	4	Fort Benton		do	do.
223	6	Yellowstone		Gen. Warren	do.
224	2	do		do	do.
225	1	do		do	do.
226	1	Near Fort Union, Nebraska		do	do.
227	1	Medicine Bow		Capt. Bryan	do.
228	2	North Platte		do	do.
229	2	Utah Basin		Capt. Beckwith	do.
230	2	do		do	do.
231	1	do		do	do.
232	1	do		do	do.
233	1	Salt Lake		Capt. Stansbury	do.
234	3	Salt Lake Valley		Bowman	do.
235	4	Salt Lake to California		do	do.
236	1	Sweetwaters of Platte		do	do.
237	4	do		Dr. Gambel	do.
238	1	do		Capt. Sitgreaves	do.
239	2	Zuni River		do	do.
198	1	Santa Fe, New Mexico		Governor	Type.
8447	1	New Mexico		Dr. O. Loew	Alcoholic.
8442	1	Colorado	July —, 1873	Dr. C. G. Newberry	do.
8444	5	Colorado Springs, Colorado	July —, 1874	Dr. H. C. Yarrow	do.
8514	1	do	July —, 1874	John Yarrow	do.
4699	1	Crossing Little Colorado		Lieut. J. C. Ives, U. S. A.	do.
8443	2	Pagosa, Colorado	Sept. —, 1874	Lieut. A. W. Whipple, U. S. A.	do.
8452	5	Fort Lowell, Arizona	Aug. —, 1874	H. W. Henshaw	do.
8513	1	do	Oct. 17, 1874	J. H. Rutter	do.
8152	1	Arizona	—, 1871		do.
8515	1	Taos, New Mexico	Aug. —, 1874	Cope, Yarrow, Shedd	do.
8449	1	Santa Fe, New Mexico	June —, 1874	H. W. Henshaw	do.
8446	2	New Mexico	Sept. —, 1876	W. G. Shedd	do.
8451	2	Abiquiu, New Mexico	Aug. —, 1874	Dr. O. Loew	do.
8448	12	New Mexico		do	do.
8445	2	San Ildefonso, New Mexico	Aug. —, 1874	Dr. H. C. Yarrow	do.
8450	3	Rio Colorado, New Mexico	Aug. —, 1874	do	do.
5321	4	Box Elder, Utah		C. McCarthy	do.
8102	1	Deseret City, Utah		Dr. H. C. Yarrow	do.
4953	3	Pecos River, Texas		Capt. John Pope, U. S. A.	do.
9414	1	Fort Benton, Montana		Dr. Geo. Suckley, U. S. A.	do.
4612	4	Fort Riley, Kansas		H. Brandt	do.
8575	2	Apache, Arizona	Aug. —, 1873	Dr. O. Loew	do.
9196	3	Fort Union, New Mexico	—, 1875	R. Connell	do.
9197	1	Nebraska		H. B. Mollhausen	do.
9196	6	Yellowstone River	July —, 1873	Dr. F. V. Hayden	do.
9199	1	Fort Stellacoom, Washington		do	do.
4604	2	Fort Laramie, Wyoming		Dr. J. R. Warren	do.

Phrynosoma douglassii hernandesi Girard—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
9200	2	(?)		Dr. F. V. Hayden	Alcoholic.
5115	8	Kansas		Reynolds and Hayden	do.
4585	1	Sand Hills			do.
9458	1	Upper Fire Hole Basin		C. Hart Merriam	do.
9635	3	Santa Fe, New Mexico	June —, 1872	Dr. C. G. Newberry	do.
9637	8	White Mountains, Arizona.	Aug. —, 1873	do.	do.
8652	2	Beaver, Utah	May —, 1878	Yarrow and Henshaw	do.
10191	10	White River Canyon, Arizona.		Dr. R. T. Burr	do.
11858	6	Fort Whipple, Arizona	— —, 1865	Dr. E. Cones, U. S. A	do.
11857	18	do		do.	do.
11862	1	do	— —, 1865	do.	do.
11849	2	St. Thomas, Arizona		Dr. E. Palmer	do.
10191	8	White River Canyon, Arizona.	— —, 1879	Dr. R. T. Burr	do.
10786	1	Sydney, Nebraska	Feb. 10, 1876	Lieut. E. Crawford, U. S. A.	do.
10687	1	Camp Warren, Arizona	Aug. 10, 1878	H. W. Henshaw	do.
5277	1	Kansas		Dr. Reynolds	do.
5272	6	Fort Buchanan, Arizona		Dr. B. J. D. Irwin, U. S. A.	do.
5455	5	Fort Bridger, Wyoming			do.
5241	11	(?)		Capt. R. Anderson, U. S. A.	do.
5142	6	Kansas			do.
4927	10	Northern Utah		C. McCarthy	do.
4866	6	Santa Fe, New Mexico		Howard	do.
4864	9	do		do.	do.
4820	14	Nebraska			do.
3219	3	Zufli River, New Mexico		Dr. S. W. Woodhouse	do.
9313	2	Bridgers Pass, Wyoming		W. S. Wood	do.
9312	1	Mexican Boundary Survey.		Maj. W. H. Emory, U. S. A.	do.
9308	3	Bridgers Pass, Wyoming		W. S. Wood	do.
9283	1	Colorado Springs, Colorado	— —, 1879	Miss A. Beach	do.
8184	2	Utah			do.
15724		Canyon Spring, Arizona		Stejneger	do.
15725		Hulls Spring, Arizona		do.	do.
15726		Canyon Spring, Arizona		do.	do.
16000-1		McCart's, Valencia County, New Mexico.		Edwin F. Farr	do.
16198		San Francisco Mountain, Arizona.		U. S. Dept. Agriculture	do.
17148		Tucson, Arizona			do.
19338-41		Mexican boundary line		Dr. E. E. Mearns	do.
22232-4		Fort Huachuca, Arizona		U. S. Dept. Agriculture	do.
22668		Cimarron, New Mexico		Th. Blackiston	do.
16196-200		Fort Bridger, Wyoming		U. S. Dept. Agriculture	do.

PHRYNOSOMA DOUGLASSII ORNATISSIMUM Girard.

Phrynosoma douglassii ornatissimum COPE, Check List Batr. Rept. N. Am., 1875, p. 49.

Tapaya ornatissima GIRARD, Herpt. U. S. Expl. Expd. (Ch. Wilkes) 1858, p. 396; U. S. and Mex. Bound. Surv., 1859, p. 9.—DUMÉRIL and BOCOURT, Miss. Sci. Mex., 1870, pl. XI, figs. 6, 6a.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 227.

Phrynosoma orbiculare HALLOWELL, Sitgreaves Exp., 1853, p. 125, pls. VIII, IX (not of Daudin).

Phrynosoma ornatissimum STEJNEGER, N. Amer. Fauna, No. 3, 1890, p. 115, pl. XII, fig. 3.

In this form the "temporal" (supratemporal) region is produced farther posteriorly than in the typical examples of *P. d. hernandesi*, so that the occipital emargination is deeper. The young present the form characteristic of the latter species; however, this character may be associated with long-tailed specimens of obscure coloration. The tail of the female

of the *P. d. ornatissimum* is very short, but in the male it is sometimes more than half the length of the head and body, as in *P. hernandesi*. The typical coloration consists of dark brown spots surrounded by a yellow border on the dorsal region, but the yellow border may be visible on the posterior side of the spot, as in *P. hernandesi*. The spots may also extend to the sides, as in that form I do not find the differences in the form of the head to be constant, although in typical forms that of the *P. d. ornatissimum* is more obtuse than in the *P. d. hernandesi*.

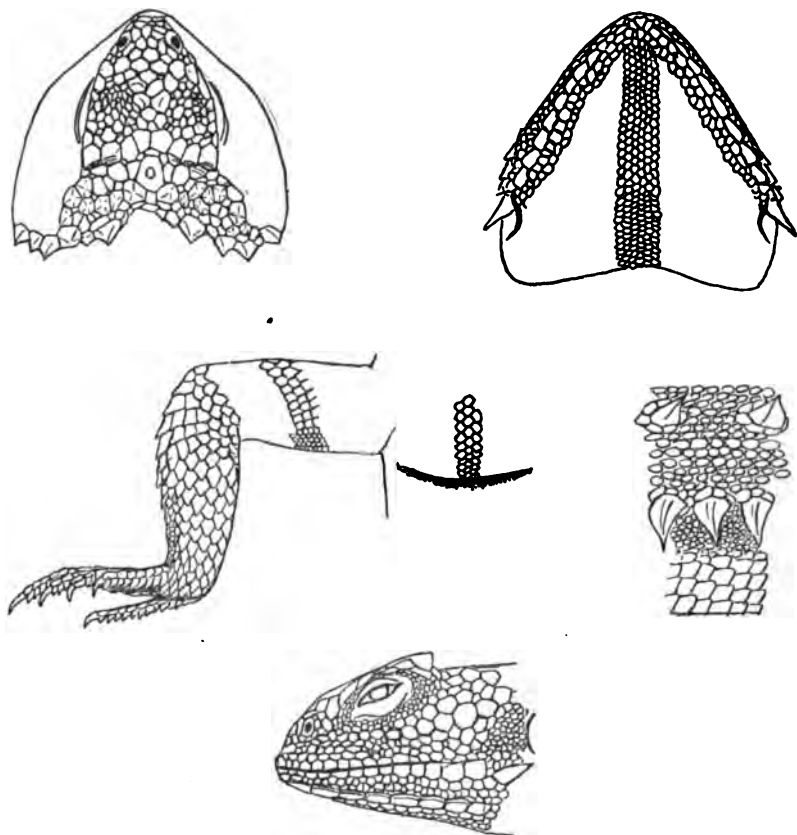


Fig. 71.

PHRYNOSOMA DOUGLASSII ORNATISSIMUM GIRARD

× ½.

New Mexico.

Cat. No. 190 (!).

Measurements (Cat. No. 204, female).—Total length, 124 mm.; length to vent, 88 mm.; length to gular fold (posterior), 19 mm.; length to occipital notch (straight), 12 mm.; greatest width of head, 24.5 mm.; width between superciliary angles, 12 mm.; length of fore leg, 37 mm.; length of fore foot, 12 mm.; length of hind leg, 47 mm.; length of hind foot, 17 mm.; greatest width of body, 55 mm.

According to Stejneger this is the desert form of the species. In Arizona Dr. Merriam only found it on the Painted Desert, while he found the *P. d. hernandesi* in the cedar and pine belts in the San Francisco Mountain region.

Phrynosoma douglassii ornatissimum.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
199	1	Between Antioch and Cuesta.	.....	Whipple	Alcoholic.
200	1	Between St. Domingo and Albuquerque.	.....	do	do.
201	1	Albuquerque .....	.....	do	do.
202	1	Near Gold Mountains .....	.....	do	do.
203	1	Canadian .....	.....	do	do.
204	2	Zuni Mountains .....	.....	Sitgreaves	Type.
205	1	Pecos River and Rio Grande.	.....	Emory	do.
206	1	Between Janos and San Luis Spring.	.....	do	do.
4785	2	Santa Fe, New Mexico.	.....	Howard	do.
8436	5	Rock Canyon, Arizona.	July —, 1874	J. H. Rutter	do.
8088	5	Cove Creek, Utah.	— —, 1872	Dr. H. C. Yarrow	do.
4580	1	Little Colorado River .....	.....	Lieut. J. C. Ives, U. S. A.	do.
14584	3	Upper Colorado region .....	.....	do	do.
3222	1	Near 38° latitude .....	.....	Lieut. E. G. Beckwith, U. S. A.	do.
4592	2	Pole Creek	— —, 1857	Lieut. F. T. Bryan, U. S. A.	do.
4596	3	Jalapa, Mexico .....	.....	R. M. D'Oca	do.
17149	1	Tucson, Arizona.	.....	Herbert Brown	

PHRYNOSOMA ORBICULARE Wiegmann.

Phrynosoma orbiculare WIEGMANN, Isis, 1828, p. 367.—WAGLER, Descr. et Icon. Amph., 1833, pl. XXIII, figs. 1, 2.—SCHINZ, Naturg. und Abbild. der Rept., 1833, pl. 27, fig. 2.—GRAVENHORST, Act. Acad. Caes. Leopold.-Carol. Nat. Cur., XVI, Pt. 2, 1833, p. 912, pl. 63.—WIEGMANN, Herpet. Mex., 1834, p. 53.—DUMÉRIL and BIBRON, Erp. Gén., IV, 1837, p. 321.—GRAY, Cat. Spec. Liz. Coll. Brit. Mus., 1845, p. 228.—AUG. DUMÉRIL, Cat. Méth. Coll. Rept. Paris, 1851, p. 78.—CH. GIRARD, Stansbury's Expl. Vall. G. Salt Lake, Utah, 1852, p. 359.—SUMICHRIST, Arch. Sc. Phys. Math., XIX, 1864, p. 60.

Tapayazin, *Lacertus orbicularis* HERNANDEZ, Nov. Plant. Anim. Min. Mex., 1651, C. XVI, p. 327, fig.

Tapaya orbicularis CUVIER, Règ. Anim., II, 1817, p. 35; 2d ed. II, 1829, p. 37.—GIRARD, U. S. Expl. Ex. (Ch. Wilkes), 1858, p. 394.—AUG. DUMÉRIL and BOCOURT, Més. Sci. au Mexique et dans l'Amérique Centrale, Pt. 1, 1870, pl. XI, fig. 1; Pt. 3, 1874, p. 221.

Phrynosoma wiegmanni GRAY, Zool. Beechey's Voy., 1839, p. 96.

Head thick, wider than long. Cephalic spines average length; those of the occiput horizontal and a little more prolonged backward than the longest temporal ones. Two rather large tubercles back of the occipital plate. Abdominal scales smooth and square.

Length of head from the end of the snout to the extremity of one of the occipital points equal to its greatest width; width of head double the space between the superciliary borders; sublabial plates pointing backward, rather larger than the inframaxillary scutella; the latter, rectangular in form, are arranged in a row under each branch of the lower jaw; a conical, pyramidal scale at the junction of the lips; nos-

trils pierced at the anterior extremity by the superciliary ridge; auricular cavity bordered in front by granular scales; occipital plate distinct, as large as one of the two tubercles which border the posterior edge; sixteen to twenty pores on the inner part of the thigh; tail two-fifths the total length of the animal, characterized in the male by a thick base and by two rather large scales in the postanal region; two or three scales similar in shape beneath each arm; length of tibia not equal to the distance from the end of the snout to the beginning of the occipital spines; scales of the belly, neck, and chest, and those underneath the tail smooth.

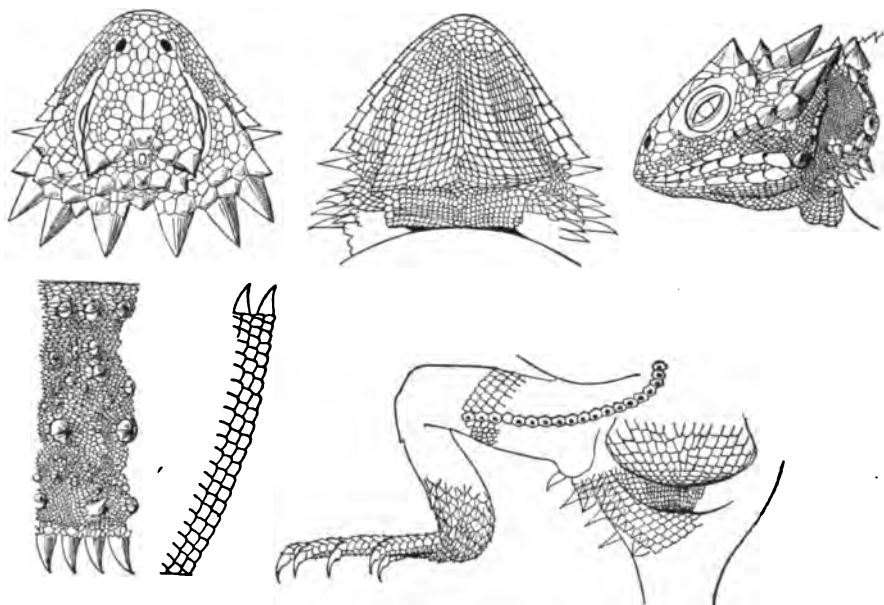


Fig. 72.

PHRYNOSOMA ORBICULARE VAR. TYPICUM WIEGMANN.

× 1.5.

Jalapa, Mexico.

Cat. No. 4598, U.S.N.M.

General color sienna brown. On the neck and back, on each side of the vertebral line, are four transverse brown or black spots outlined with yellow; tail and limbs crossed likewise by brown bands. Under-side covered with confluent black spots on a yellowish-white ground color. (Bocourt.)

Bocourt distinguishes three varieties of this lizard, which differ as follows:

Occipital horns longer than temporal; occipital scales large.... *P. orbiculare typicum*.
Occipital horns shorter than longest temporal; occipital scales large.

P. orbiculare var. *A*.

Occipital horns shorter than longest temporal; occipital scales smaller, numerous.

P. orbiculare var. *B*.

The typical form has been received at the Museum of Paris from the States of Vera Cruz and Pueblo, and from the Mexican Plateau. Our specimens are from the northern plateau at Chihuahua and southern Arizona. The var. A came from the high lands of Vera Cruz, and the var. B from Colima, on the west coast.

Phrynosoma orbiculare Wiegmann.

Catalogue No.	Number of specimens.	Locality.	From whom received.
8313	6	Chihuahua, Mexico.....	John Potts.
(1)	(1)	Fort Huachuca, Arizona.....	Dr. T. Wilcox, U. S. A.
4596	3	Jalapa, Vera Cruz, Mexico.....	R. M. De Oca.

PHRYNOSOMA BOUCARDII Bocourt.

Phrynosoma boucardii BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 243.

Tapaya boucardii AUG. DUMÉRIL and BOCOURT, Miss. Sci. Mex., 1870, pl. XI, figs. 4, 4a; Pt. 3, 1874, p. 225.

Head, thick; wider than long. Cephalic spines of moderate length; those of the occiput directed obliquely upward, a little more prolonged backward than the longest ones of the temporal region. Numerous occipital tubercles. Trihedral scales of the body projecting. Abdominal scales smooth. Head with top relatively narrow, not equal half its greatest length; the contour from the end of the muzzle to the superciliary angle a little curved oblique line. Inframaxillary scutella rectangular, a little smaller than the posterior sublabials; one conical, pyramidal scale at the junction of the lips; nostrils pierced on the prolonged superciliary ridge; auricular opening bordered anteriorly with small projecting scales; occipital plate distinct, oval, and followed by numerous conical scales; upper part of the body bristling with projecting trihedral tubercles. Eleven to fourteen pores on the inner side of the thigh; tail about two-fifths the length of the animal and characterized in the males by a little greater length, a thicker base, and by two postanal scales somewhat larger than the others. A fringe around the periphery of the abdomen formed of twenty-six or twenty-seven large trihedral, subpyramidal scales; four similar scales over each arm; length of tibia equal to the distance between the end of the snout and the beginning of the occipital spines; scales of the belly and the under-side of the tail smooth; those of the throat feebly keeled.

Ground color ocher yellow, with four brown spots extending on both sides of the vertebral line; the one on the neck large and rounded, the three others, on the trunk, subrectangular, with bright yellow posterior borders; legs and tail crossed by similar brown bands; head and cephalic spines sienna brown. Underside yellowish, with rounded blackish spots scattered far apart.

Phrynosoma boucardii, like *Phrynosoma orbiculare*, has a var. A, head wider than long, but it is easy to distinguish the latter by the following

characters: Interorbital space narrower; occipital spines implanted obliquely; occipital tubercles smaller, and consequently more numerous; trihedral scales of all parts of the body more bristling; and the gular scales feebly keeled and not entirely smooth. (Bocourt.)

The erect direction of the occipital spines of this species distinguishes it from the others of the *orbiculare* group.

No specimens of the *Phrynosoma boucardii* are in the U. S. National Museum. M. Bocourt's specimens came from the "Plateau of Mexico," without further specification of locality.

PHRYNOSOMA SOLARE Gray.

Phrynosoma solare GRAY, Cat. Liz. Brit. Mus., 1st ed., 1845, p. 229.—VAN DEN BURGH, Proc. Cal. Acad. Sci., IV, 1894, p. 456.

Phrynosoma regale GIRARD, Herpet. U. S. Expl. Exp. (Ch. Wilkes), 1858, p. 406.—GIRARD (BAIRD), Rept. U. S. Mex. Bound. Surv., 1859, p. 9, pl. xxviii, figs. 1-3.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 235; 1870, pl. xii, fig. 12.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 245.

Outline of muzzle from above broadly rounded; in profile abruptly descending without conspicuous angle with front, nor prominent lip border. Nostrils presenting anteriorly only, the nasal plates separated by a row of scales from the series of the canthus rostralis, which pass externally to them. Temporal region considerably expanded. Posterior superciliary angle produced horizontally. Four occipital horns of subequal length, the external pair slightly divergent, and all directed backward 45°. Each horn depressed, and with the basal portions marked with flat tubercles. Only three prominent temporal scales, and all of these produced into horns, which are flat and recurved to the acute tips. The posterior, which is the longest, is not equal to the external occipital. Temporal row of scales not produced to below the orbit, but a row of protuberant scales above it reaches the same point. Scales of top of head flat, tubercular. Two transverse rows of conic scales, of four scales each, posterior to the occipital, the external of the posterior row the largest. No angle or row of larger scales connecting the posterior superciliaries. A well-developed keystone plate. Infralabials eight on each side, all prominent except the anterior three, the seventh largest and as long as the anterior temporal spine, the eighth smaller and spiniform. No subtrical. Enlarged gulars in a single row, with acute apices, the posterior not enlarged. Two rows of spines on the side of the neck, the superior shorter and more bunched.

Dorsal scales flat, the median much larger than the lateral, keeled, and with small, round tubercles on the plane portions. Four spaced rows of larger keeled scales on each side of the middle line, those of the external rows much smaller than those of the median. These extremities are scarcely free, but those of the penultimate row are most prominent, especially anteriorly, where the external row is wanting. Lateral fringe continued to above humerus from groin, its

lanceolate scales closely placed. Scales of the short inferior row quite small, and separated from the superior by small, round scales separated by interspaces. Arm and forearm covered above with large keeled and mucronate scales, of thigh with small keeled scales, mixed with large, more or less free, keeled scales, and tibia with large keeled and mucronate scales, with a few small ones intermixed.

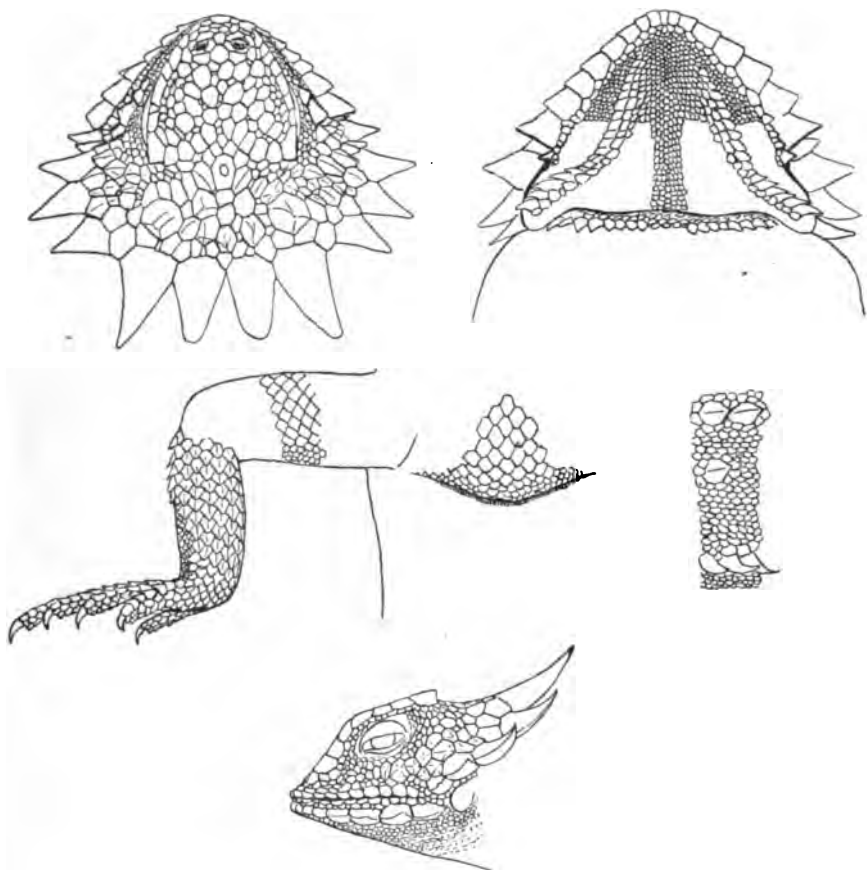


Fig. 73.

PHRYNOSOMA SOLARE GRAY.

× $\frac{1}{2}$.

Old individual with middle horns worn.

Arizona.

Cat. No. 8437, U.S.N.M.

Tail with two lateral fringes of conic scales at the base, the inferior row short and composed of small scales, the superior continued to near the end of the tail. Superior pholidosis of tail irregular, with larger and smaller keeled and tubercular scales, which are more or less free at the apices. Keeled scales of humeri continued across thorax on clavicular angle. Median gular scales rounded. Scales of

inferior surfaces smooth, except those of the tibia and forearm, which are keeled and mucronate. Collar serrate except at middle. The hind leg extended falls short of the axilla. The tail is rather long, exceeding by a little twice the length of the head without the horns. First and fifth toes of equal length on both extremities. Femoral pores eleven to fifteen on each side, the rows continuous on the median line, or nearly so.

Measurements (Sonora).—Total length, 140 mm.; length to vent, 89 mm.; length to gular fold, 19.5 mm.; length of head with horns, 32 mm.; length of head without horns, 22 mm.; Width of head at temporal region, 19 mm.; length of fore leg, 40 mm.; length of fore foot, 12 mm.; length of hind leg, 49 mm.; length of hind foot, 20 mm.

General color above light brown; median line pale; lateral nuchal spots present, obscure; three or four pairs of blackish blotches on each side of the median line, which are of irregular outline, concave forward, and not fused into transverse bands; tail and limbs with broad, brown cross bands; inferior surfaces immaculate; head light brown, horns paler.

This species occupies an isolated position in the genus for several reasons. The presence of four equally developed occipital horns instead of the two which characterize all the other species, the continuity of the femoral pore series across the middle line, and the tuberculation of the scales are the principal ones. The squamation is like that of the *coronatum* group, but in the short series of scales ending in the temporal horns it is more like the *cornutum* group, with which it also agrees in the matters of infralabials and inferior gular scales.

Specimens of this species display some noteworthy differences. In two Arizona individuals the temporal and occipital horns are in a single slightly curved plane. In the specimen from Sonora, above described, the second and third (posterior) temporals are on a distinctly lower plane. In Cat. No. 161, also from Sonora, these horns are depressed, but less so. In Cat. No. 8437, from Arizona, the series of femoral pores are separated on the middle line by four rows of scales, and the pores number on one side eighteen and on the other twenty. In Cat. No. 17179, from Tucson, the series include twenty pores each, and are separated by one scale on the middle line. In my Sonoran individual but one scale separates the adjacent pores of opposite rows, and the latter contain 11–12 pores. In Cat. No. 161 each row contains seventeen pores, and five rows separate them at the middle. In Cat. No. 8437 there is on each side of the superior side of the tail, beyond the base, a tetrahedral conic scale looking directly upward, which is wanting in the Sonoran specimen. In Cat. No. 8437 one has seven and the other eight large infralabials; there are seven in the Sonoran individual. Cat. No. 17179 has seven on one side and eight on the other. No other differences are observable.

The *Phrynosoma solare* is restricted to the Sonoran region. It has

been obtained so far only in southern Arizona and the Mexican State of Sonora. It is rare in collections. Besides one in my possession from near Hermosillo, Sonora, I have seen the following in the U. S. National Museum:

Phrynosoma solare Gray.

Catalogue No.	Number of specimens.	Locality.	From whom received.
161	1	Gila and Colorado Desert, Arizona	A. Schott.
8437	2	Camp Lowell, Arizona	Lieutenant Rutter.
17179	1	Tucson, Arizona.....	P. L. Jouy.

Mr. Van Denburgh gives Las Animas Bay, Lower California, as a locality from which he has seen a specimen.

It is with regret that I adopt for this species the name of Gray in preference to that of Girard. The description of Gray is unworthy of the name, being only a line in length, and may apply to this or to some unknown species so far as its terms go. Moreover, he evidently did not regard it as a good species, but placed his specimen under the head of *P. blainvillei*, as belonging to that species. An examination of the specimen in the British Museum showed me that it is to an example of the *P. regale*, that the name *P. solare* applies, and as technically one line is a description, I am compelled to side this time with the pettifoggers, and adopt it.

PHRYNOSOMA BLAINVILLEI Gray.

Phrynosoma blainvillei GRAY, Zool. of Beechey's Voy., 1839, p. 96, pl. XXIX, fig. 1; Cat. Liz. Brit. Mus., 1st ed., 1845, p. 228.—COPE, Check List Batr. Rept. N. A., 1875, p. 49; Proc. Acad. Nat. Sci. Phila., 1883, pp. 28, 30.—STEJNEGER, North American Fauna, No. 7, 1893, p. 187, pl. II, fig. 2.—VAN DENBURGH, Proc. Cal. Acad. Sci., 2d ser., V, Pt. 1, 1894, p. 296; 1895, p. 118.

Phrynosoma coronatum HOLBROOK, N. Amer. Herpet., II, 1842, p. 97, pl. XIII.—GIRARD, Stansbury's Exped. Gt. Salt Lake, 1852, p. 36, pl. VIII, figs. 7-12.—HALLOWELL, Sitgreaves's Exped. Zuni, 1853, p. 122.—BOULENGER, Cat. Brit. Mus., 2d ed., II, 1885, p. 243, in part; not of Blainville.

Batrachosoma coronatum GIRARD, Herpet. U. S. Expl. Ex., 1858, p. 400, pl. XX, figs. 10-13.—BOCOURT, Miss. Sci. Mex. Rept., p. 239, pl. XII, fig. 10.

Phrynosoma frontale VAN DENBURGH, Proc. Cal. Acad. Sci., IV, 1894, p. 296.

Outline of muzzle from above narrowed elliptic; in profile descending obliquely and not separated from frontal plane by a distinct angle. Nostrils directed as much laterally as forward, in line with canthus rostralis. Posterior superciliary angle little produced. Temporal region moderately expanded, terminating in a straight horn nearly as long as the occipital, and diverging outward. Occipital horn elongate, straight, slightly divergent, depressed in section, and, like all the other horns, finely grooved longitudinally. Infralabial plates with prominent angles from the first, the median longer than the posterior, which are small, except the very last, which is a conical spine. Between the shorter scales the last inferior labial is developed into a large, flat, tri-

angular spine, the infrarictal. The conic spine above mentioned is as much opposite to this plate as to the infralabials. On the neck two short folds, one above and posterior to the other, with three conic spines on each. Three rows of enlarged gular scales on each side of the middle line, with conic apices directed externally; those of the external row the largest, and followed by a few smaller spines on the gular fold. Scales of top of head convex and obscurely roughened; a transverse

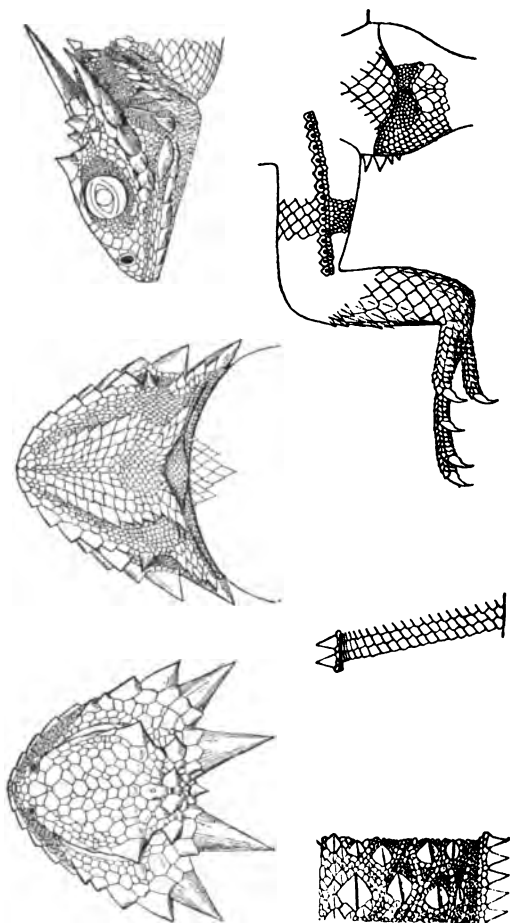


Fig. 74.
PHRYNOSOMA BLAINVILLEI GRAY.
× 8.

San Bernardino.
Collection of E. D. Cope.

series of four conic scales in front of the base of the occipital horns, and a similar one between the bases of the latter. Anterior and posterior superciliary plates in contact, with a small "keystone" below their opposed apices.

Dorsal pholidosis irregular. Medially the scales are flat and keeled, but they become much smaller and graniform laterally, where they are separated by smaller granules. A band of smaller flat scales, down the vertebral line, bounded by larger scales on each side. External to these there are four rows of well-separated, large, keeled scales, with

free apices directed posteriorly, without a circle of scales around their bases. A marginal fringe of flat lanceolate scales, extending from anterior to the groin to above the shoulder, and a lower marginal series of much smaller scales along the middle part of the lateral border. Between the superior row and the larger dorsal scales are several longitudinal folds, surmounted each with a series of oval keeled scales larger than those that surround them. Superior surfaces of fore limb with large keeled mucronate scales, mixed with a few of smaller size. Upper surface of posterior limb with small scales, and scattered large keeled spinous scales. Tail with a lateral fringe of large, flat, lanceolate scales to near the extremity; the superior surface with irregular pholidosis of flat keeled scales, some with projecting apices. Scales of all the inferior surfaces smooth, except those of the humerus and tibia, which are weakly keeled. Keeled scales of front of humerus not continued across the middle line.

Extended hind leg reaching to axilla or middle of humerus. Tail a little over twice as long as head without horns. Femoral pores fifteen in each row, which is separated from the opposite one by a wide interspace.

Measurements (San Diego, California).—Total length, 147 mm.; length to vent, 92 mm.; length to gular fold, 20 mm.; length of head with occipital horn, 32 mm.; length of head without occipital horn, 22 mm.; width of head at temporal region, 23 mm.; length of fore leg, 43 mm.; length of fore foot, 26 mm.; length of hind leg, 57 mm.; length of hind foot, 23 mm.

Color above light brown; head light-yellowish brown, without darker markings. Temporal spines light red or pink, occipital horns mahogany brown, with reddish apices; the ridges darker than the grooves. Lateral nuchal brown spots large, well separated. Between these and the groin on each side three dusky brown bilobate cross bands, obscurely defined anteriorly; in young specimens with imperfect posterior light border. Inferior surface of limbs and tail with a few obscure crossbars. Inferior surfaces immaculate, except a few obscure dusky spots on the abdomen in some individuals.

This species inhabits the southern part of the Pacific district, that is, California south of San Francisco Bay, and the upper part of the peninsula of Lower California, at least as far south as San Thomas (Van Denburgh). In the northern part of the Pacific district its place is taken by the *P. douglassii*. No other species occupies the range of the *P. blainvillei*.

Mr. Van Denburgh states that specimens from the northern part of this range have the head scales less convex and more rugose than in those from the southern portion of it, and he proposes to regard the former as a distinct species, under the name of *P. frontale*. No other character is advanced by Mr. Van Denburgh, so that specific distinctness can scarcely be admitted. Perhaps a race is indicated. Its value appears, however, to be problematical, as specimens in my possession

from San Diego, in the extreme south, have the head scales strongly rugose, although convex.

Mr. Van Denburgh points out that this species differs from the *P. coronatum* in the presence of a spine behind the subtrietal scale, a character which I find to be quite constant. I may add that the *P. coronatum* is more horny as to the peripheral parts of the skull. There are four horns of the temporal series, of which the anterior is below the eye. In *P. blainvillei* this scale is little or not larger than the one that succeeds it. In *P. blainvillei* a postorbital row of scales is very protuberant, and not so in *P. coronatum*. In *P. blainvillei* there is but one row of scales in the marginal fringe of the tail, while there are two in *P. coronatum*.

Habits.—Dr. Stejneger states that it is to *P. blainvillei* that the published accounts about ejecting blood from the eyes should be credited, and one of the specimens in the collection brought home (Cat. No. 18452) is the offender who gave rise to Dr. O. P. Hay's entertaining article¹ on this subject. It transpired afterwards that this specimen had been sent me [Stejneger] alive for the very reason that it had been ejecting blood repeatedly when caught. The letter from Mr. Bailey accompanying the specimen turned up long after Dr. Hay's experience with the animal, and it is to the following effect:

KERNVILLE, CAL., July 11, 1891.

DEAR SIR: I caught a horned toad to-day that very much surprised Dr. Fisher and myself by squirting blood from its eyes. It was on smooth ground and not in brush or weeds. I caught it with my hand and just got my fingers on its tail as it ran. On taking it in my hand a little jet of blood spurted from one eye a distance of 15 inches and spattered on my shoulder. Turning it over to examine the eye, another stream spurted from the other eye. This he did four or five times from both eyes until my hands, clothes, and gun were sprinkled over with fine drops of bright red blood. I put it in a bag and carried it to camp, where, about four hours later, I showed it to Dr. Fisher, when it spurted three more streams from its eyes. One of the same species that I caught July 2 evidently did the same, as I found its head covered with blood when I caught it, but supposed it was injured in the weeds. It seems so strange that I send the horned toad to you alive.

VERNON BAILEY.

The specimen upon its arrival was handled a great deal, but gave no evidence of its blood-squirting tendencies until the beginning of August, when it resented Dr. Hay's handling it somewhat roughly in the manner related. In order to give the entire history of this animal, I reprint Dr. Hay's account as follows:

About the 1st of August it was shedding its outer skin, and the process appeared to be a difficult one, since the skin was dried and adhered closely. One day it occurred to me that it might facilitate matters if I should give the animal a wetting; so, taking it up, I carried it to a wash basin of water near by and suddenly tossed the lizard into the water. The first surprise was probably experienced by the *Phrynosoma*, but the next surprise was my own, for on one side of the basin there suddenly appeared a number of spots of red fluid, which resembled blood. . . . A microscope was soon procured and an examination was made, which immediately showed that the matter ejected was really blood.

¹Proc. U. S. Nat. Mus., XV, 1892, pp. 375-378.

The affair now became very interesting. Just where the blood came from I could not determine with certainty, the whole thing having happened so suddenly and unexpectedly; yet the appearance seemed to indicate that the blood came from the region about one of the eyes. There appeared to be a considerable quantity of the blood, since on the sides of the vessel and on the wall near it I counted ninety of the little splotches. A consultation was had with Dr. Stejneger the next day with regard to the propriety of dashing the animal into the water again to discover, if possible, where the blood came from. It was thought, however, that such blood lettings must be somewhat exhausting, and that it would be better to allow the animal a day to recuperate. While talking, I picked up the lizard and was holding it between my thumb and middle finger and stroking its horns with my forefinger. All at once a quantity of blood was thrown out against my fingers, and a portion of it ran down on the animal's neck; and this blood came directly out of the right eye. It was shot backward and appeared to issue from the outer canthus. It was impossible to determine just how much there was of the blood, but it seemed there must have been a quarter of a teaspoonful. I went so far as to taste a small quantity of it, but all that I could detect was a slight musky flavor.

Phrynosoma blainvilliei Gray.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
152	1	California		Fremont	Alcoholic.
153	3	do		Williamson	do.
154	5	Bodega, California		do	do.
155	4	California		Stevens	do.
156	1	Monterey		Trowbridge	do.
157	4	San Diego		do	do.
158	3	do			do.
159	1	San Francisco			do.
160	1	Eldorado, California			do.
4587	12	Fort Tejon, California		J. Xantus	do.
8862	1	San Francisco, California	Nov. —, 1875	A. W. Chase	do.
129	2	Bonora		Col. J. D. Graham	do.
8645	1	Mohave Desert, California	—, 1875	Dr. O. Loew	do.
8647	1	do	July —, 1875	do	do.
8648	3	Santa Barbara, California	July —, 1875	H. W. Henshaw	do.
9674	1	San Pedro, California	July 24, 1883	Dr. J. G. Cooper	do.
11933	1	California		Dr. Thos. Webb	do.
11854	1	Santa Barbara, California			do.
10784	1	(?)		Prof. D. S. Jordan	do.
10780	1	Santa Barbara, California			do.
21462					do.
21965-67		Jamul Creek, El Nido, San Diego County, California		Dr. E. A. Mearns	do.
21968		Tia Juana River, Mon. 258, Pacific Ocean, California		do	do.
21969-70		Mon. 258, Pacific Ocean, California		do	do.
21971		Th's Cameron's ranch, San Diego County, California		do	do.
21972		J. M. Gray's ranch, San Diego County, California		do	do.
21973		Campo, San Diego County, California		do	do.
21974-79		Nachoguero Valley, U. S. border, Lower California		do	do.
21980		Tia Juana River, Mon. 258, Pacific Ocean, San Diego County, California		do	do.
21981-91		Jacumba Hot Springs, Mon. 233, San Diego County, California		do	do.
21992		West slope Coast Range, San Diego County, California		do	do.
21993		Campo San Diego County, California		do	do.

Phrynosoma blainvilliei Gray—Continued.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When collected.	From whom received.	Remarks.
			<i>Feet.</i>			
18446	Male ..	Walker Pass, California		July 2	Bailey	
18447	Female ..	do		do	do	
18448	Male ..	do		do	Fisher	Western slope.
18449	Male ..	Walker Basin, California		July 14	Bailey	
18450	Female ..	South Fork, Kern River, California	2,750	July 7	do	
18451	Female ..	Kernville, California		June 23	Palmer	
18452	Male ..	do		July 11	Bailey	Ejected blood from eye.
18453	Male ¹ ..	Fresno, California		Sept. 23	do	
18454	Male ¹ ..	do		do	do	
18455	Female ¹ ..	do		do	do	
18456	Female ..	Bakersville, California		Oct. 11	Nelson	
18457	Male ..	Carrizo Plains, California		do	do	
18458	Female ..	do		do	do	
18459	Female ..	Old Fort Tejon, California		July 4	Palmer	
18460	Male ..	Cañada de las Uvas, California		July 9	do	

¹ Young.

PHRYNOSOMA CERROENSE Stejneger.

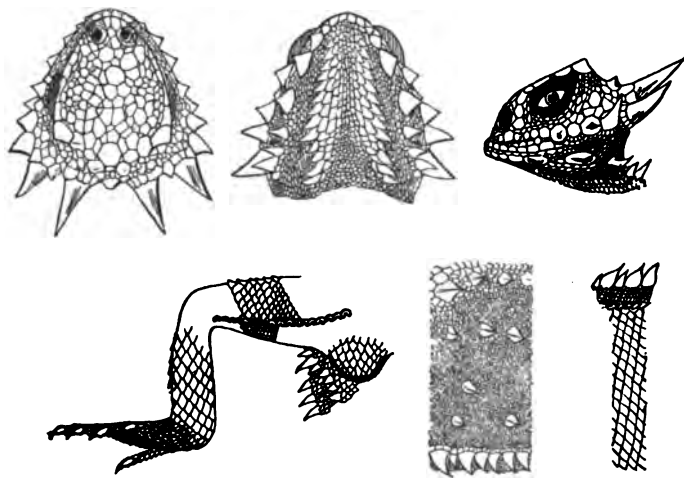
Phrynosoma cerroense STEJNEGER, North American Fauna, No. 7, Pt. 2, 1893, p. 187.

Fig. 75.

PHRYNOSOMA CERROENSE STEJNEGER.

Cerro Island, Lower California.

Cal. No. 11971, U.S.N.M.

Outline of muzzle from above narrowed, then rounded; in profile descending abruptly with prominent labial margin. Nostrils in line with canthus rostralis, presenting equally laterally, and anteriorly. Superciliary angle not produced. Temporal region not especially expanded, supporting on each side four produced tubercles, the short anterior one beneath the eye and separated from the second by a low tubercle. Last (fourth) temporal horn the longest, shorter than the

occipital and divergent in direction. Occipital horn straight, acute, divergent, slightly grooved at base, directed posteriorly at an angle of 45° . Scales of front flat, rugose, large; those of supraocular series in contact. No angle connecting superciliary angles. Four conic scales in a transverse series in front of occiput; a median occipital conic scale. No prominent scales between the temporal series and the orbit. Only five infralabials on each side, the last prominent and anterior to the line of the larger subtrical. A conic scale or spine in the line of the infralabials, behind the subtrical. Three rows of enlarged gulars on each side, the external conic and acute, and continued to the gular fold. Behind the line of the tympanic meatus two longitudinal rows of scales, the inferior of two spiniform, the superior of five or six simply conic.

Five to eight rows of flat-keeled scales on the median dorsal region; some of which, forming an irregular row on each side, are much larger than the others. External to these the scales are rounded and much smaller, and are separated by granules. On each side of the middle line are three rows (including the one above mentioned) of large, prominent-keeled scales, well separated from each other. A single series of free lanceolate scales forms a lateral fringe, which begins in front of the groin and returns to above the humerus, with an interruption above the axilla. Below this the scales are granular, and then gradually enlarge into the ventrals, which are smooth and about as large as the median dorsals. Superior sides of humerus and cubitus covered with large keeled scales; femur and tibia above with small, flat scales mixed with large acuminate ones. Tail with two series of lateral marginal conic scales, the superior row sparse. Scales of superior surface of tail heterogeneous, but no produced cones. Scales of inferior surfaces of limbs smooth, except those of palm and sole, which are keeled. Lateral digital scales not produced.

The extended hind limb falls considerably short of the axilla. The tail is between once and twice the length of the head without horns. Femoral pores 17 or 18 in each series, which are well separated on the middle line.

Measurements (Cat. No. 11977).—Total length, 112 mm.; length to vent, 85 mm.; length to gular fold, 17 mm.; length to base of occipital horn, 17 mm.; length to end of occipital horn, 23.5 mm.; width at temporal region, 21.5 mm.; length of fore leg, 34 mm.; length of fore foot, 11 mm.; length of hind leg, 46 mm.; length of hind foot, 19 mm.

Ground color brownish ashen, paler on the limbs and tail. A large brown lateral nuchal spot, and three irregular cross bands on the back, the third at the groin. Each cross band displays a deep notch posteriorly, and the external portion extends posteriorly, joining the one behind it, causing the flanks to be entirely brown. No distinct cross bands on limbs and tail; snout and muzzle brown; occipital horns mahogany. Inferior surfaces cream-colored, with a few indistinct dusky spots on the abdomen.

As already shown, this species is an ally of the *P. coronatum* and *P. blainvillei*, between which it stands in some respects, while it adds some characters of its own. Of the latter kind are the absence of the inferior lateral fringe, the cylindric horns, and the continuation of the enlarged gulars to the gular fold. It agrees with the *P. blainvillei* in the presence of a spine behind the subrietal, the absence of a prominent row of tubercles behind the orbit, in the small size of the interoccipital scale, and the straightness of the occipital horns. It agrees with the *P. coronatum* in the suborbital cone, the double fringe of the tail, and the flat head scales. But one specimen of this species is known. It was brought from Cerros Island, which is off the west coast of Lower California, at about the middle of its length.

Phrynosoma cerroense Stejneger.

Catalogue No.	Number of specimens.	Locality.	From whom received.
11977	1	Cerros Island, Lower California.	L. Belding.

PHRYNOSOMA CORONATUM Blainville.

Phrynosoma coronatum DUMÉRIL and BIBRON, *Erpétologie Générale*, IV, 1837, p. 318.—COPE, *Proc. Acad. Nat. Sci. Phila.*, 1866, p. 312.—BOCOURT, *Miss. Sci. Mex.*, *Réptiles*, Pt. 1, pl. XII, fig. 10, Pt. 4, 1874, p. 239 (part).—COPE, *Bull. U. S. Nat. Mus.*, No. 1, 1875, pp. 50, 93.—YARROW, *Bull. U. S. Nat. Mus.*, No. 24, 1883, p. 70 (part).—COPE, *Bull. U. S. Nat. Mus.*, No. 32, 1887, p. 39.—STEJNEGER, *North Amer. Fauna*, No. 7, 1893, p. 187, pl. II, fig. 1.—VAN DEN BURGH, *Proc. Cal. Acad. Sci.*, (2) IV, Pt. 1, 1894, p. 296; 1895, p. 115.

Phrynosoma BAIRD, *Proc. Acad. Nat. Sci. Phila.*, 1859, p. 299.

Phrynosoma cornutum YARROW, *Bull. U. S. Nat. Mus.*, No. 24, 1883, pp. 66, 67 (part).—BELDING, *West. Amer. Scientist*, III, 1887, p. 98.—STEJNEGER, *North Amer. Fauna*, No. 7, 1893, pl. II, figs. 1-1c; not of Harlan.

Phrynosoma asio YARROW, *Bull. U. S. Nat. Mus.*, No. 24, 1883, p. 67.—BOULENGER, *Cat. Liz. Brit. Mus.*, II, 1885, p. 244 (part).—BELDING, *West. Amer. Scientist*, III, 1887, p. 98; not of Cope.

Phrynosoma hernandezi YARROW, *Bull. U. S. Nat. Mus.*, No. 24, 1883, p. 68 (part).

Agama (*Phrynosoma*) *coronata* BLAINVILLE, *Nouv. Ann. Mus.*, Paris, IV, 1835, p. 284, pl. XXV, fig. 1.

The nostrils are pierced in the lines joining the superciliary ridges with the end of the snout. There are several longitudinal series of large, pointed, gular scales, the exterior of which are continued back upon the gular folds. There is a series of fine, very large, pointed sublabial plates. The head spines are very large. There are four temporals, one occipital, and one postorbital on each side, and one large interoccipital. Occasionally small spines are developed between the temporals. Below the rictus is a broad spine, usually without any, but sometimes with a very small spine behind it. There is a row of four or five spinose scales in front of the occipital spines. The other head scales, with few exceptions, are flat and rugose, usually with irregular

ridges radiating from near the center of each scale. There are two groups of spines on each side of the neck, the lower larger. The tail is bordered with a single row of lateral spines and bears a group of smaller ones behind the insertion of the thigh. There are two series of periphoro-abdominal spines, the lower shorter than the upper and formed of smaller spines. The scales on the chest are sometimes faintly keeled. Those on the abdomen and basal part of the tail are smooth; on the terminal part of tail, keeled. The tympanum is naked. There are from sixteen to twenty-two femoro-preanal pores. The males have enlarged postanal plates. The tails of the females are shorter than the distance from the axilla to the front of the thigh, but those of the male are considerably longer than this distance. The young of

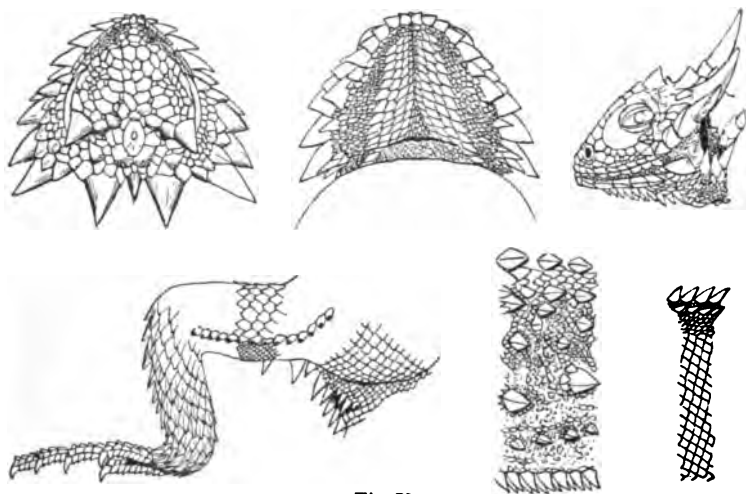


Fig. 76.

PHRYNOSOMA CORONATUM BLAINVILLE.

= 1.

San Diego, California.

Cat. No. 14687, U.S.N.M.

both sexes have short tails. The color above is brownish, yellowish, or grayish, darker laterally. There is a large brown patch on each side of the neck, and a series of three more or less distinct brown bars on each side of the back. These bars are light-bordered posteriorly. The tail is transversely banded with brown. The belly is often dotted or blotched with brown or black. All these markings are more distinct in the young. The larger dorsal tubercles are often tipped with orange-rufous, and those on each side of the median line have seal-brown or black keels. The occipital spines are ribbed with very dark brown. The temples are yellow tinged with rufous. In very young individuals the scales of the vertex are grayish or yellowish-white, with a few minute brown or black spots. These spots, which are on the raised portions of the scales, become more numerous as the animals increase

in size, until the whole crown appears black or dark brown, crossed by irregular lines formed by the yellow posterior edges of the scales.

Phrynosoma coronatum was first described from a specimen collected by Botta in "California." It has since been recorded from Cape St. Lucas and La Paz. The specimens enumerated below show that it ranges far north of the limits of the "Cape Region."

Phrynosoma coronatum Blainville.

Catalogue No.	Number of specimens.	Locality.	From whom received.
5246	1	Cape St. Lucas, Lower California.....	L. Belding.
12664	3	La Paz, Lower California.....	John Xantus.
11538	5	Cape St. Lucas, Lower California.....	R. E. C. Stearns.
14777	1	San Diego, California.....	C. R. Orcutt.
16506	1	Colorado Desert, California.....	Dr. C. H. Merriam.
16997	1	Twin Oaks Coast Range, San Diego County, California.	Nat. Zool. Park.
17171	1	Mesa Grande, San Diego County, California.	Miss Rosa Smith
14586	15	San Diego, California.....	do.
14587	5	do.....	do.
14588	40	do.....	do.

PHRYNOSOMA CORNUTUM Harlan.

Phrynosoma cornutum GRAY, Syn. Rept. Griff., Cuvier's Anim. Kingd., IX, 1831, p. 45; Cat. Liz. Brit. Mus., 1845, p. 229.—HOLBROOK, N. Amer. Herpt., II, 1842, p. 87, pl. xi.—GIRARD, Stansb. Expl. Gt. Salt Lake, 1852, p. 360, pl. viii, figs. 1-6.—E. BLANCHARD, Organ. Reg. Anim., 1852, Pt. 5, pl. xii.—HALLOWELL, Sitgreaves Expd. Zuffi, 1853, p. 119.—GIRARD, Herpt. U. S. Expl. Expd., 1858, p. 403, pl. xxi, figs. 6-9; U. S. Mex. Bound. Surv., 1859, p. 9.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 236, 1870, pl. xii, fig. 9.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 245.

Agama cornuta HARLAN, Journ. Acad. Nat. Sci. Phila., IV, 1825, p. 299, pl. xx; VI, 1829, 14; Med. and Phys. Res., 1835, p. 141, plate, figs. 1, 2.—GRIFFITH, Cuvier's Anim. Kingd., IX, 1831, p. 216.

Tapaya cornuta CUVIER, Reg. Anim., 2d ed., II, 1829, p. 37.

Tropidogaster cornutus FITZINGER, Syst. Rept., I, 1843, p. 79.

Tropidogaster bufonium FITZINGER, Syst. Rept., I, 1843, p. 79.

† *Lacerte tapayazis* BARTON, Med. and Phys. Jour., III, II (1807†), p. 68.

Phrynosoma bufonium WIEGMANN, Isis, 1828, p. 367.—GRAY, Syn. Rept. Griff., Cuvier's Anim. Kingd., IX, 1831, p. 45.

Phrynosoma harlanii WIEGMANN, Herpt. Mex., I, 1834, p. 54.—DUMÉRIL and BIBRON, IV, 1837, p. 314.—SPRING and LACORDAIRE, Anat., Pt. 2, 1842, p. 192 (Bull. Acad. Roy. Bruxelles).—AUG. DUMÉRIL, Cat. Méth. Coll. Rept. Mus. Paris, 1851, p. 28.

Phrynosoma orbiculare HOLBROOK, N. Amer. Herpt., II, 1842, p. 93, pl. xii.

Phrynosoma planiceps HALLOWELL, Proc. Acad. Nat. Sci. Phila., VI, 1852, p. 178; Sitgreaves Exp., 1853, p. 124, pl. vii.

Head short, muzzle descending steeply in profile, but not separated from the front by a conspicuous angle. Nostrils directed forward and separated from the scales of the canthus rostralis by a single scale. Posterior superciliary angle produced into a short horn. Temporal region expanded, supporting three horns, the anterior short, the

median equal to or longer than the posterior one; all directed outward at an angle of 45 degrees. The series does not extend to below the orbit. Occipital horns moderate, acute, well separated, slightly divergent, and directed 45 degrees upward. Scales of front and vertex rugose, three conic scales posterior to the occipital, the posterior a median occipital. A row of conic scales connecting posterior superciliary angles in front of parietal. Infralabials prominent and acute posteriorly, the last equal to or longer than the first temporal. One row of enlarged gulars. No subtrical spine. On each side of the posterior gular border a small spine. Two longitudinal folds on the side of

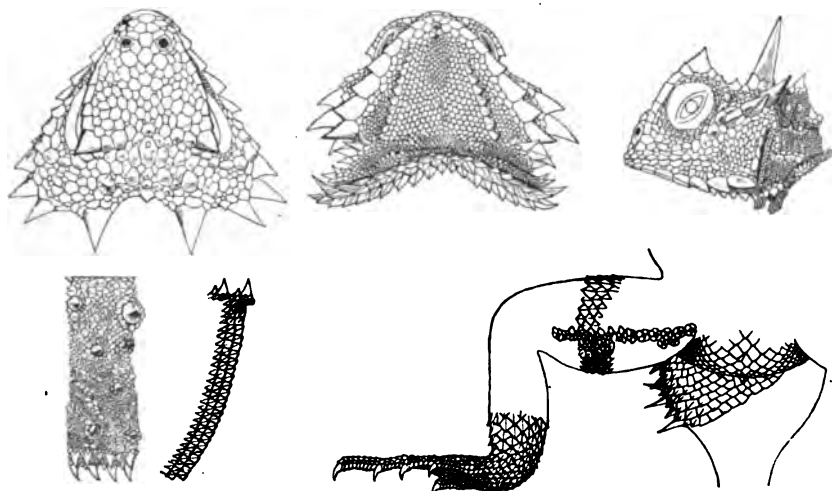


Fig. 77.

PHRYNOSOMA CORNUTUM HARLAN.

× 2.

West Texas.

Cat. No. 4953, U.S.N.M.

the neck, several spinous scales on the inferior and longer, and one on the superior and shorter. Below the inferior an oblique series descends forward to the plane of the enlarged gulars.

Dorsal scales larger, flat, and keeled medially, graduating to smaller ones laterally. A row of large, flat, keeled scales on each side of the vertebral line. External to these, on each side, about four series of enlarged keeled scales, with free apices directed posteriorly, and situated at considerable intervals. The scales of the internal row are considerably larger than those of the external. Gular scales small, rounded, sometimes keeled. Ventrals weakly keeled or smooth. Superior surface of humerus and cubitus covered with large keeled and mucronate scales, with very few small ones intermixed. Femur and tibia covered above with smaller keeled scales, with a few large spinous scales intermixed. Large keeled scales of humerus extended across the clavicular ridge. Two rows of spinous scales on each side, the

superior row consisting of larger spines and continued beyond the inferior row to above the humerus. Tail with a marginal row of spines on the basal half and intermixed larger scales on the superior surface. A second and short row of marginal scales below the longer one, extending posteriorly from the posterior base of the femur. Scales on inferior faces of limbs and tail, except the femur, keeled, the tail most strongly.

The hind limbs are short, not reaching the axilla. Tail scarcely or less than twice as long as head without the horns. Femoral pores present in males only, 9-12 in each series, which are well separated on the abdomen.

Measurements (Cat. No. 8316).—Total length, 148 mm.; length to vent, 104 mm.; length to gular fold, 24 mm.; length to end of occipital horn, 32 mm.; length to base of occipital horn, 21 mm.; width at temporal spines, inclusive, 36 mm.; length of fore leg, 47 mm.; length of fore foot, 17 mm.; length of hind leg, 61 mm.; length of hind foot, 24 mm.

Color above brown, divided by a narrow paler vertebral stripe. A dark brown spot on each side of the nape, and two rows of three oval or round dark brown spots on each side of the back. Those of the last two pairs are sometimes confluent into two irregular transverse bands. The brown spots have sometimes pale borders. Three dark brown cross bands on top of head, and three dark brown bands from the orbit, the anterior two to the infralabials, the last to the extremity of the second temporal horn. Occipital horns reddish brown. Legs and tail with rather smoke brown cross-bands. Inferior surfaces cream color, sometimes with small scattered dusky spots.

The range of this species exceeds that of any other *Phrynosoma*. It extends from Dallas, Texas, on the east to Chihuahua, inclusive, on the west, and from the Gulf of Mexico on the south to southern Kansas and Colorado on the north. It does not occur on the Pacific slope. It is very common in Texas and south to Monterey, Mexico, and in New Mexico as far north as Taos. Like other species of the genus, it loves dry places and sunshine. It has a habit of running in roads, where a good many are killed in ruts, yet a larger number climb out and escape, to the surprise of the traveler, who thinks they are doomed to death. They are favorites as pets, and if they will eat, live a considerable time in confinement. They not infrequently, however, starve themselves to death, though their capacity to live without food is marvelous. The horns of this species are more acute than those of any of the others, which makes it more dangerous as an article of diet for snakes. I once found a dead snake with the occipital horns of this species protruding on opposite sides of the vertebral column near the head.

A specimen with smooth abdominal scales was the basis of the nominal species *P. planifrons*.

Phrynosoma cornutum Harlan.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
107	12	Matamoras .....	.....	Lieut. Couch	Alcoholic.
108	7	do .....	.....	do	do.
109	4	do .....	.....	do	do.
110	7	Brownsville .....	.....	Van Vliet	do.
111	1	Tamaulipas .....	.....	Dr. Edwards	do.
112	3	Patos, Coahuila .....	.....	D. N. Couch	do.
113	7	Castannulus, Coahuila .....	.....	do	do.
114	1	Alamos de Parnas, Coahuila .....	.....	do	do.
115	1	Rio Natas, Coahuila .....	.....	do	do.
116	2	Charco Escondido, Tamaulipas .....	.....	do	do.
117	4	Monterey, Nuevo Leon .....	.....	do	do.
118	1	Pesgueria Grande, Nuevo Leon .....	.....	do	do.
119	5	Galveston, Texas .....	.....	Dean	do.
120	1	St. Joseph Isle, Texas .....	.....	Wurdeinan	do.
121	7	Indianola, Texas .....	.....	Graham	do.
122	2	San Antonio, Texas .....	.....	do	do.
123	6	Between Rio Puerco and Comm. .....	.....	Emory	do.
124	2	Between Las Nogales and Rio Grande .....	.....	do	do.
125	1	Chihuahua .....	.....	do	do.
126	6	Eagle Pass .....	.....	do	do.
127	2	Rio Grande, west of San Antonio .....	.....	Churchill	do.
128	4	Point Isabel, Texas .....	.....	Wurdeinan	do.
129	2	Sonora .....	.....	Graham	do.
130	1	Texas .....	.....	Agassiz	do.
131	1	Fort Gibson .....	.....	Prof. Baird	do.
132	3	Fort McKavit, Texas .....	.....	Anderson	do.
133	2	Texas .....	.....	do	do.
134	1	Fort Smith, Arkansas .....	.....	Shumard	do.
135	7	Brasos River, Texas .....	.....	do	do.
136	2	Cross the Arkansas .....	.....	Potts	do.
137	23	Red River, Arkansas .....	.....	Marcy	do.
138	4	Between Pecos River and Rio Grande .....	.....	Whipple	do.
139	10	Near Rock Mary .....	.....	Lieut. Whipple	do.
140	3	Near Canadian .....	.....	do	do.
141	5	Fort Chadbourne .....	.....	Dr. Swift	do.
142	1	Western Texas .....	.....	Sitgreaves	do.
143	1	do .....	.....	do	do.
144	1	do .....	.....	Capt. J. Pope	do.
145	1	Rio Pecos .....	.....	do	do.
146	1	Fort Thorne, New Mexico .....	.....	do	do.
147	2	Llano Estacado .....	.....	do	do.
148	1	Headwaters of Trinity River .....	.....	do	do.
149	1	Rio Pecos .....	.....	do	do.
150	2	Fort Townsend .....	.....	Dr. L. A. Edwards	do.
4537	2	Fort Mason, Arkansas .....	.....	Maj. G. H. Thomas, U. S. A.	do.
4953	3	Pecos River, Texas .....	.....	Capt. John Pope, U. S. A.	do.
5181	1	Fort Stockton, Texas .....	.....	P. Duffy	do.
9408	3	La Meilla, Texas	— —, 1872	O. H. Woodworth	do.
8438	1	Arizona .....	.....	J. H. Rutter	do.
8439	1	Camp Bowie, Arizona	Aug. 13, 1874	H. W. Henshaw	do.
8509	1	do	Aug. 10, 1874	J. H. Rutter	do.
7814	2	Fort Riley, Kansas .....	.....	Dr. B. J. D. Irwin, U. S. A.	do.
4590	4	Fort Bliss, New Mexico .....	.....	Dr. S. W. Crawford, U. S. A.	do.
8510	1	do .....	.....	Exp. W. of 100th M.	do.
1428	1	Zuni and Colorado rivers .....	.....	Dr. L. A. Edwards, U. S. A.	do.
155	4	California .....	.....	Governor Stevens	do.
4590	1	Little Colorado River .....	.....	Lieut. J. C. Ives, U. S. A.	do.
10496	1	Fort Supply, Indian Territory	Aug. —, 1880	Dr. A. W. Taylor	do.
8576	1	Southeastern Arizona	— —, 1873	H. W. Henshaw	<i>P. planiceps</i>
8447	1	New Mexico .....	.....	Dr. O. Loew	Alcoholic.
8442	1	Colorado	July —, 1873	Dr. C. G. Newberry	do.
8444	5	Colorado Springs, Colorado	July —, 1874	Dr. H. C. Yarrow	do.
8514	1	do	July —, 1874	John Yarrow	do.
4599	1	Crossing Little Colorado .....	.....	Lieut. J. C. Ives, U. S. A.	do.
8443	2	Pagosa, Colorado	Sept. —, 1874	Lieut. A. W. Whipple, U. S. A.	do.

Phrynosoma cornutum Harlan—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8452	5	Fort Lowell, Arizona	Aug. —, 1874	H. W. Henshaw	Alcoholic.
8513	1	do	Oct. 17, 1874	J. H. Rutter	do.
8152	1	Arizona	—, 1871	do	do.
8515	1	Taco, New Mexico	Aug. —, 1874	Cope, Yarrow, Shed	do.
8440	1	Santa Fe, New Mexico	June —, 1874	H. W. Henshaw	do.
8446	2	New Mexico	Sept. —, 1876	W. G. Shedd	do.
8451	2	Abiquiu, New Mexico	Aug. —, 1874	Dr. O. Loew	do.
8448	12	New Mexico	do	do	do.
8445	2	San Ildefonso, New Mexico	Aug. —, 1874	Dr. H. C. Yarrow	do.
8450	3	Rio Colorado, New Mexico	Aug. —, 1874	do	do.
5321	4	Box Elder, Utah	do	C. McCarthy	do.
8102	1	Deeriet City, Utah	do	Dr. H. C. Yarrow	do.
4953	3	Pecos River, Texas	do	Capt. John Pope, U. S. A.	do.
9414	1	Fort Benton, Missouri	do	Dr. Geo. Suckley, U. S. A.	do.
4612	4	Fort Riley, Kansas	do	H. Brandt	do.
8575	2	Apache, Arizona	Aug. —, 1873	Dr. O. Loew	do.
9196	3	Fort Union, New Mexico	—, 1875	R. Connell	do.
9197	1	Nebraska	do	H. B. Mollhausen	do.
9198	6	Yellowstone River	July —, 1873	Dr. F. V. Hayden	do.
(?)	(?)	Fort Huachuca, Arizona	do	Dr. T. Wilcox, U. S. A.	do.
22235	do	Willcox, Arizona	do	Fisher	do.
15538-40	do	Cook County, Texas	do	G. H. Ragsdale	do.
17081-2	do	Cameron County, Texas	do	C. K. Worthen	do.
17395	do	Dallas, Texas	do	C. W. Richmond	do.
17397-9	do	Southwest Missouri	do	do	do.
19303-216	do	Mexican boundary line	do	Dr. E. A. Mearns	do.
26860-75	do	Fort Clark, Texas	do	do	do.
20956	do	Rockport, Arkansas County, Texas	do	H. P. Attwater	do.

ANOTA Hallowell.

Anota HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1852, p. 182.—BOCOURT, Mission Sci. Mex., Rept., 1874, p. 230.

Doliosaurus GIRARD, U. S. Expl. Exp. (Ch. Wilkes), Herpet., 1858, p. 407.

This genus only differs from *Phrynosoma* in the concealment of the tympanic drum by the integument, which is scaly. Girard has proposed another name for it on the ground that *Anota* is preoccupied. But this is not the case, as such names as *Anotia*, *Anotus*, etc., can not be regarded as identical with *Anota*.

Four species are known to me, which differ as follows:

I. No marginal abdominal fringe of elongated scales.

a. No enlarged gular scales.

b. Nostrils above or within the canthus rostralis.

Horns moderate; posterior temporal about equal to occipital; enlarged dorsal scales not prominent; ventrals smooth; small. *A. modesta* Girard.

II. One series of elongate marginal abdominal scales.

a. No enlarged gular scales.

Occipital horns with acute tubercle at external base; head scales much divided; twelve labials to middle of eye; caudal fringe coarse; cross-spotted *A. calidiarum* Cope.

III. Two series of elongate marginal abdominal scales (the inferior wanting posteriorly).

a. No enlarged gular scales.

b. Nostrils within canthus rostralis.

Tympanum scaly; horns well developed; infralabials prominent; large dorsals not prominent; ventrals smooth *A. goodii* Stejneger.

aa. Enlarged gular scales present.

b. Nares within canthus rostralis.

Horns shorter; tail less depressed, with coarse lateral fringe; median dorsal scales irregular; cross-spotted *A. platyrhina* Girard.

Horns longer; tail flattened, with fine lateral fringe; median dorsal scales in two parallel rows; a median brown dorsal stripe, no cross bars..... *A. maccallii* Hallowell.

The last-named three species resemble each other more nearly than they do the *A. modesta*. They agree in having the spinous scale with its basal circle above the humerus more conspicuously developed, and in the enlargement of those scales of the head posterior to the parietal. The lateral scales of the digits are also more elongate and prominent. Their femoral pores are at the margin of the large scale, the smaller posterior ones forming a half rosette. In the *A. modesta* they are mostly pierced within the border of the large scale, and rarely in a rosette.

ANOTA MODESTA Girard.

Phrynosoma modestum GIRARD, Stansb. Expd. Gr. Salt Lake, 1852, p. 361, pl. vi, figs. 4-8.—BOCOURT, Miss. Sc. Mex. Rept., 1874, p. 232.—BOULENGER, Cat. Liz. Brit. Mus., 1885, p. 248.—COPE, Proc. Acad. Nat. Sci. Phila., 1892, p. 335.

Doliosaurus modestus GIRARD, U.-S. Expl. Expd., Herpet., 1858, p. 309; U. S. Mex. Bound. Sur., 1859, p. 10.

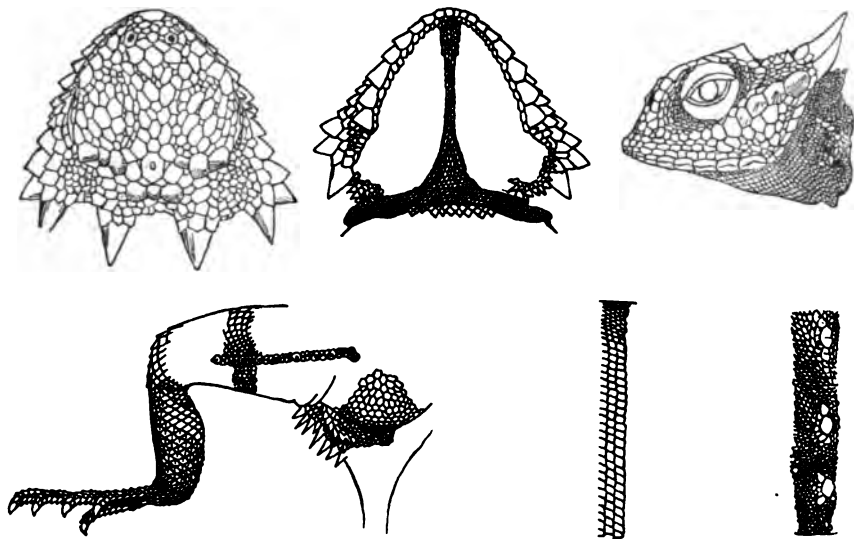


Fig. 78.

ANOTA MODESTA GIRARD.

× 2.

Mexican boundary.

Cat. No. 168, U.S.N.M.

The smallest of the species. Head broadly rounded; muzzle very obtuse, the profile descending steeply from a transverse angle above the nostrils. Temporal regions expanded, supporting a series of acumi-

nate tubercles from below the front of the orbit, of which the posterior only is distinctly a horn. It is directed posteriorly, having usually the same direction and length of the occipital. One short acute occipital horn on each side; no interoccipital. Posterior superciliary plate angular, but not prominent. Infralabials increasing regularly in size to the posterior, which are not very prominent. Gular scales equal. A strong prehumeral fold, in front of which is a fossa, and in front of this a semicircular fold convex backward with a few larger tubercles on its border. Cephalic scales rugose with points and ridges. Supraorbitals partly separated by a single row of scales. Central supraoculars equal supraorbitals. Anterior and posterior superciliaries separated by two scales.

Dorsal scales of irregular sizes, the median keeled. On each side of the middle line four rows of widely separated transversely oval scales, with a longitudinal keel and apex slightly raised above the general level, and with a few large scales (smaller than those just mentioned) at their bases, which do not form complete annuli. These large scales alternate in their respective rows, though not regularly, and a few flat scales of intermediate size are scattered between them. Scales of superior surfaces of limbs of irregular sizes, keeled, and larger than those of inferior surfaces, which are smooth except on the tibia, where they are keeled. Scales of inferior surfaces of head and body smooth.

The hind limb appressed to the side reaches to or nearly to the shoulder. The tail is swollen at the base and then contracts abruptly, the remainder being slender and compressed cylindric. Its pholidosis is irregular, but it has no lateral fringe. Femoral pores forming a continuous series across the belly, and numbering from ten to twelve on each side of the middle line.

Measurements (Cat. No. 8316).—Total length, 95 mm.; length to vent, 55 mm.; length to gular fold, 15 mm.; length of head above to end of occipital horn, 18.5 mm.; length of head above base of occipital horn, 13.5 mm.; greatest temporal width of head, 21 mm.; length of fore leg, 29 mm.; length of fore foot, 10 mm.; length of hind leg, 35 mm.; length of hind foot, 15 mm.

In life the color of this species is a light yellowish brown, sometimes with a shade of pink. A blackish spot begins on each side of the nape and extends round to a point anterior to the humerus. There is sometimes a sooty shade on each side from the middle to the groin. A small blackish spot behind the vent on the middle line, and frequently a similar spot on each side of the anterior border of the vent. There are no dorsal spots or crossbars, but the tail is indistinctly annulate with blackish. Under surfaces pale yellowish, immaculate, except the gular region, which is generally indistinctly dusky spotted.

This small species ranges from western Texas to Arizona and Chihuahua, inclusive. General Pope sent it from the head waters of the Colorado, on the eastern side of the Llano Estacado, and I traced it

from this point as far north as Clarendon, which is on the head waters of the Red River. I found it common in southwestern New Mexico, and Potts obtained it from south of the city of Chihuahua. Its western limit has not been ascertained.

In its habits this species resembles other horned lizards, delighting in bright sunshine, in dry and rocky ground, and in endeavoring to protect itself with its sharp horns when caught.

Anota modesta Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
163	1	Rio Grande, west of San Antonio.	.....	Churchill.....	Alcoholic.
164	8	San Antonio to El Paso.....	.....	Graham.....	do.
165	2	El Paso.....	.....	do.....	do.
166	4	Sierra de la Narizo, Sonora.....	.....	do.....	do.
167	1	do.....	.....	Emory.....	do.
168	2	Los Nogales and Rio Grande.	.....	do.....	do.
169	2	Between Pecos and Rio Grande.	.....	do.....	do.
170	1	Near Janos, Chihuahua.....	.....	do.....	do.
171	2	Western Texas.....	.....	Sitgreaves.....	do.
172	1	Near Canadian.....	.....	Whipple.....	do.
173	1	Rio Grande, between San Domingo and Albuquerque.	.....	do.....	do.
174	4	Between Antonio and Custer.	.....	do.....	do.
175	3	Plains.....	.....	Gambel.....	do.
176	10	Castanuelas, Coahuila.....	.....	Couch.....	do.
177	2	Alamo de Parras.....	.....	do.....	do.
178	1	Buena Vista.....	.....	do.....	do.
179	1	Rio Nzas.....	.....	do.....	do.
180	3	Pesqueria Grande, Nuevo Leon.	.....	do.....	do.
181	3	Plains about Chihuahua.....	.....	Potts.....	do.
182	1	Chihuahua River and tributaries.	.....	do.....	do.
183	1	110 miles north of Chihuahua.	.....	do.....	do.
184	3	Between Gaudalupe Mountains and Rio Pecos.	.....	Pope.....	do.
185	1	Head waters of Colorado.....	.....	do.....	do.
186	4	Llano Estacado.....	.....	do.....	do.
187	1	.....	.....	do.....	do.
188	10	Indianola to Nueces.....	.....	do.....	do.
193	1	Agua Nueva, Coahuila.....	.....	Couch.....	do.
8511	2	San Ildefonso, New Mexico.	Aug. —, 1874	Dr. H. C. Yarrow.....	do.
8440	1	New Mexico.....	.....	Dr. O. Loew.....	do.
4854	2	Pecos River, Texas.....	.....	J. K. Townsend.....	do.
5176	2	Fort Stockton, Texas.....	.....	P. Duffy.....	do.
8441	1	Camp Apache, Arizona.....	July —, 1874	J. H. Rutter.....	do.
9401	1	.....	.....	.....	do.
4580	1	Little Colorado River.....	.....	Lient. J. C. Ives, U. S. A.....	do.
9402	2	.....	.....	.....	do.
10797	5	Whewakan Valley, Oregon.....	Aug. 13, 1878	H. W. Henshaw.....	do.
17396	.....	....., Arizona.....	.....	C. W. Richmond.....	do.
19317-37	.....	Mexican boundary line.....	.....	Dr. E. A. Mearns.....	do.
22320	.....	Las Cruces, New Mexico.....	.....	Prof. T. D. A. Cookerell.....	do.

ANOTA CALIDIARUM Cope.

Anota calidiarum COPE, American Naturalist, 1896, October, p. 833.

A single lateral fringe of conic scales, extending on three-quarters the length between the axilla and groin; no trace of inferior fringe. Enlarged lateral gular scales only traceable below the rictus oris.

Occipital horns moderate, each with a short accessory horn at the external base. Internal temporal horn half as long as the occipital, with a short accessory horn at the external base. External temporal horn very short, and the temporals anterior to it presenting a serrate edge only. Infralabials presenting a serrate edge only. Parietal region bounded on each side by an angulate border which overhangs the temporal region.

Squamation of the head smaller than in other species. Superior labials twelve to below the middle of the eye, instead of eight or nine as in *A. platyrrhina*, the nearest allied species. Seven subequal scales in

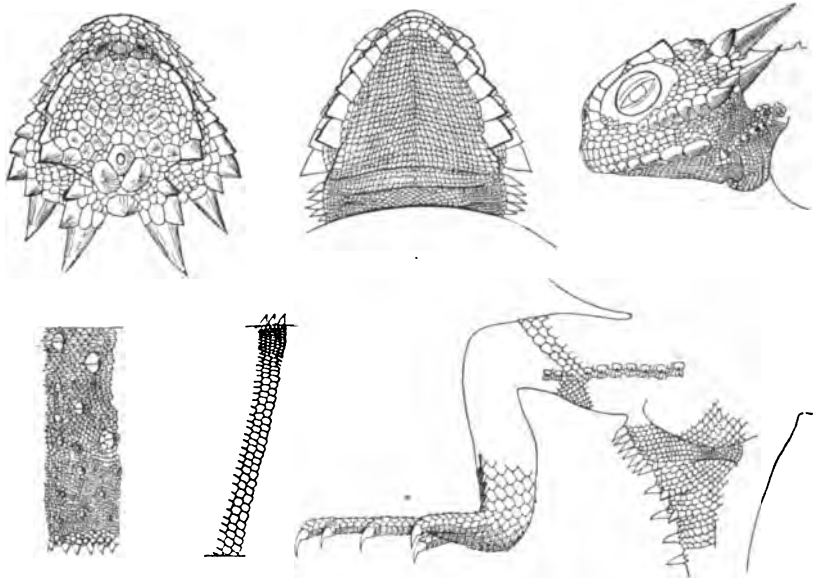


Fig. 79.

ANOTA CALIDIARUM COPE.

× 1.5.

Death Valley, California.

Cat. No. 18444, U.S.N.M.

the transverse row between the canthal rows on the frontal angle; there are five unequal scales in the corresponding position in *A. platyrrhina*. Six longitudinal rows of supraocular scales, of which a group of five or six posterior to the middle are larger but unequal. Supra-orbital rows in contact, except at points, on the median line. Last superciliary presenting a sharp angle; penultimate also presenting a prominent angle. Tomia of mouth only moderately serrate. A row of conic scales rising posteriorly, on the side of the neck, and above its posterior end an inconspicuous rosette. A conspicuous rosette above the middle of the humerus.

Dorsal scales of irregular sizes and shapes. Those that may be called

the ground scales are smaller, flat, and not keeled. They are interrupted by a few keeled scales. Besides these there is a number of rows of larger keeled scales, which are free posteriorly and are surrounded by a rosette at the base. The least prominent are those near the middle line; just external to these are the largest. They diminish in size toward the lateral borders. There are large keeled scales on the shoulder. This tract divides, the wider band extending on the posterior face of the humerus; the narrower, only one scale wide, extending on the anterior side to the elbow. The scales of the external side are of mixed sizes, and are larger than those of the internal side. The scales of the external face of the femur and tibia are like those of the dorsal region. Tail subround, bordered by a fringe of rather widely spaced conic scales.

Head scales moderately rough, tending to present a single tubercle larger than the others; scales of inferior surfaces smooth. The extended hind leg reaches to the humerus. Femoral pores 6-8, in a rosette.

Measurements.—Total length, 112 mm.; length to vent, 73 mm.; length to gular fold, 14 mm.; length of fore leg, 35 mm.; length of fore foot, 11.5 mm.; length of hind leg, 46 mm.; length of hind foot, 20 mm.; length of head to interoccipital border, 17 mm.; length of occipital horn, 7 mm.; length of internal temporal horn, 4 mm.; width of head (greatest), 20 mm.; width of head between superciliary angles, 13 mm.; width of body at middle, 38 mm.

Color above ashen, with blackish crossbars, which are well defined posteriorly only, and which are interrupted on the middle line, except on the tail, where they are continuous. Each half of the two dorsal bars presents a chevron forward. Those crossing at the groin and posterior to the vent are undulating. A large blackish spot on each side of the neck; head unspotted; humerus, elbow, and forearm each with a faint spot; femur and tibia each with a more distinct blackish crossbar. Inferior surfaces cream-colored, except a few small black spots on the posterior face of the femur and base of the tail and some fainter ones on the posterior part of the abdomen.

Anota calidiarum Cope.

Catalogue No.	Original No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
8444	434	1	Death Valley, California....	U. S. Agricultural Department.	Alcoholic.

This species is nearest to the *A. platyrhina* Girard, from which it differs in various respects. The general proportions of all the parts and the coloration are about as in that species, the difference chiefly appearing in the squamation and the horns. The scales of the head are much more subdivided, and the presence of accessory horns is unique in the genus. The simplicity of the lateral fringe is also characteristic, as is also the rudimental character of the rosette on the neck.

ANOTA GOODEI Stejneger.

Phrynosoma goodei STEJNEGER, North American Fauna, No. 7, Pt. 2, 1893, p. 191, pl. II, fig. 3.

Although larger than the *A. modesta*, this is one of the smaller species. The horns are well developed, and the temporal region is expanded and produced on each side, resembling in this respect the *A. maccallii*. Three temporal plates especially prominent, the last developed into a horn which equals the occipital in length. Like the occipitals they are divergent, and not parallel, as is the case in *A. modesta*. Posterior superciliary angle prominent, but not produced. Three last infralabials prominently angulate, the last produced, and

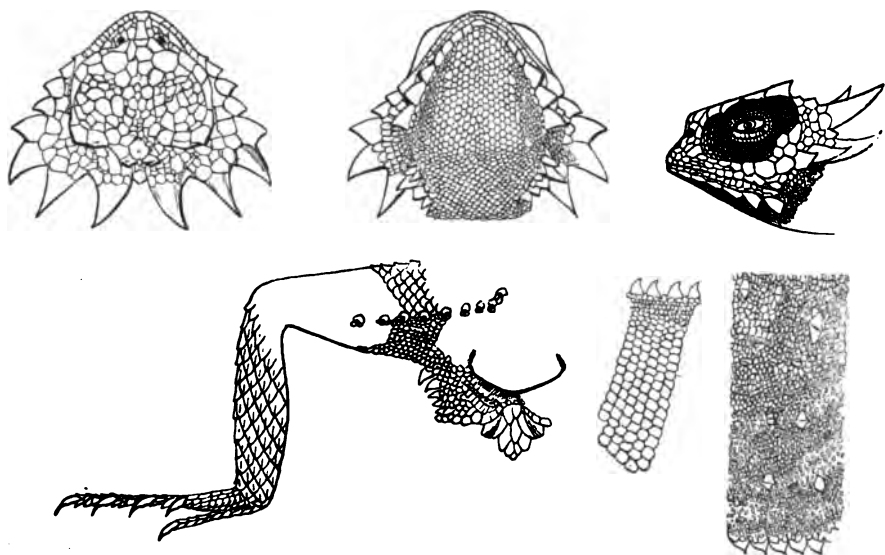


Fig. 80.

ANOTA GOODEI STEJNEGER.

SONORA.

Cat. No. 8567, U.S.N.M.

not followed by a spine. On the side of the neck two longitudinal folds, one above the other, each supporting a row of spinous scales. Muzzle concavely truncate, descending steeply from a transverse inter-preorbital angle. Scales of top of head rugose. Supraorbitals partly or quite separated by a single row of scales; anterior and posterior superciliaries in contact. Gulars subequal.

Dorsal scales unequal, the lateral smallest, the largest median keeled. Five or six rows of distant scales much larger than the rest on each side of the median line, their apices moderately prominent. The scales of the single row forming the lateral fringe are very prominent and acute. Scales of inferior surfaces smooth, except those of the tibia and feet, which are keeled; those of the belly about equal to those of

the middle of the back. Tail with a lateral fringe of pointed scales like those of the sides; the pholidosis of the superior surface irregular but without spines.

The extended hind limb reaches nearly to the posterior border of the orbit. The fifth toe equals or is shorter than the first. Femoral pores 8-10, not extended across the belly. Tail tapering, depressed throughout, 2.5 times as long as head to base of occipital horns.

Measurements (Cat. No. 8567).—Total length, 115 mm.; length to vent, 72 mm.; length to gular fold, 18 mm.; length to end of occipital horn, 20 mm.; length to base of occipital horn, 16 mm.; width at temporal horns, 22 mm.; length of fore leg, 36 mm.; length of fore foot, 12 mm.; length of hind leg, 47 mm.; length of hind foot, 19 mm.

In alcohol this species is gray above and white below. A blackish spot on each side of the nape, and three pairs of blackish spots about the bases of the large scales on the dorsal region. On each side of these the large scales have a blackish shade at the base, forming a chain-like row of spots parallel with the convex lateral outline. Tail with dusky cross lines above. Inferior surfaces immaculate.

But two specimens of this species are known, and these, in accordance with their desert habitat, are of pallid colors. It is related most nearly to the *A. maccallii*, and may be distinguished by the absence of the large row of lateral gular scales, the more expanded temporal region, the relatively shorter horns, and the generally more slender proportions.

Anota goodei Stejneger.

Catalogue No.	Number of specimens.	Locality.	From whom received.
8567	2	Sonora.....	T. H. Streets, U. S. Navy.

ANOTA PLATYRHINA Girard.

Phrynosoma platyrhinos GIRARD, Stansb. Exp. Gt. Salt Lake, 1852, p. 361, pl. VII, figs. 1-5.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 232.—STEJNEGER, N. Am. Fauna, No. 7, Pt. 2, 1893, p. 190.

Phrynosoma platyrhinus BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 247.

Phrynosoma platyrhinum COPE, Proc. Acad. Nat. Sci., Phila., 1883, pp. 8-15.

Doliosaurus platyrhinos GIRARD, U. S. Expl. Exp. (Ch. Wilkes), Herp., 1858, p. 409.

Phrynosoma maccallii YARROW, Check List N. Am. Bat. Rept., 1882, p. 65.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 248.

Head short, wide; muzzle abruptly descending from a transverse interpreorbital angle. Nares directed anteriorly, separated from canthal scales by two rows of small scales. Horns of moderate length, the occipitals divergent and a little longer than the divergent posterior temporals. Temporal region less expanded than in the *A. maccallii* and *A. goodei*, the penultimate process little longer than wide at the base. Posterior superciliary angle little produced. Posterior infra-

labials acutely angular, but not produced. One series of enlarged gulars, terminating in a few produced scales. On the side of the neck two short series of shortly conic enlarged scales, which form together a V, with open apex directed posteriorly. Supraorbitals separated by one or two rows of small scales. Three enlarged scales posterior to the parietal.

On each side of the dorsal middle line about five series of enlarged scales, which are keeled, and with the posteriorly directed apex little prominent and the base surrounded by a circle of scales of medium size. Dorsal scales flat, nearly or quite smooth, the median larger than the lateral. A fringe of prominent acute scales along the lateral edge of the

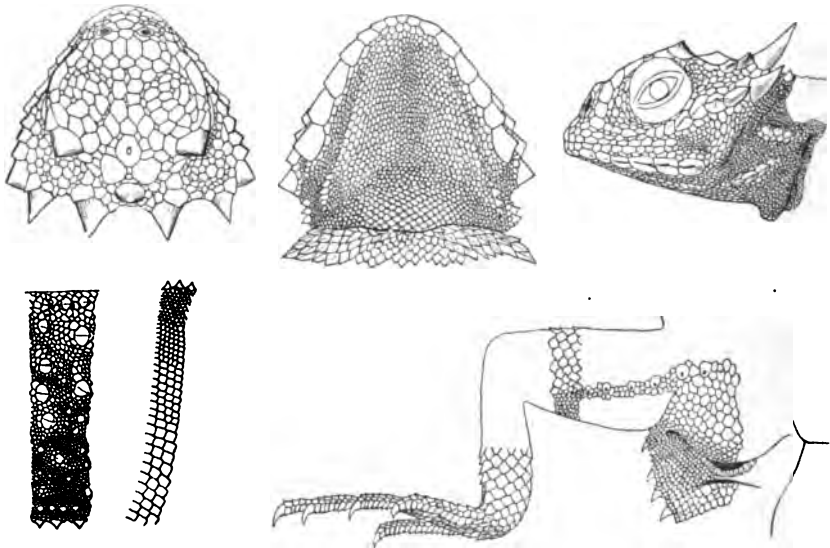


Fig. 81.

ANOTA PLATYRHINA GIRARD.

× ½.

Utah.

Cat. No. 5344, U.S.N.M.

body, with large flat ones at their dorsal bases and small ones between them and the ventrals. Ventrals about equal to median dorsals and, like all the scales of the inferior surfaces, including the tibials, smooth. Scales of external surfaces of limbs of irregular sizes; a projecting series along the front of each humerus and femur. Tail with a lateral fringe of conic scales, and large ones at intervals on the superior surface. Lateral scales of digits moderately elongate.

The tail is about twice as long as the head without the horns. The appressed hind leg reaches, or more frequently falls short of, the axilla. It is the shortest-legged species of the genus. Femoral pores 7 or 8 on each side.

Measurements.—Total length, 126 mm.; length to vent, 86 mm.; length

to gular fold, 19 mm.; length to base of occipital horns, 18 mm.; width at temporal spines, 24 mm.; length of fore leg, 35 mm.; length of fore foot, 16 mm.; length of hind leg, 48 mm.; length of hind foot, 20 mm.

In life the ground color of the dorsal region is a pinkish gray or grayish cream color, and this is marked with blackish, as follows: A large spot on each side of the nape, which may or may not be fused near the occiput, and which do not reach the humeri. From three to five chevrons directed posteriorly along the lines of the larger scales, well defined posteriorly only, and with the external extremities turned backward. These marks may become obsolete on the posterior part of the back, especially in old animals. Limbs distantly, tail rather closely, cross banded with dusky. Inferior surfaces immaculate cream color, with sometimes a few dusky specks posteriorly and on the femora. The head above yellowish or reddish brown and without color marks.

There is sometimes a shallow fissure in the scaling in the position of the tympanic membrane in this species, but I have never seen that membrane exposed in even a rudimentary manner. This may, however, rarely be the case, but no specimen has been seen, so far as I am aware, with a distinct tympanic disk.

This is the Great Basin horned lizard, and is not found outside of its limits. It ranges from southeastern California to northern Nevada and southern Idaho. From the latter State Dr. J. L. Wortman sent me a specimen from the Bruneau River. I found it abundant near Pyramid Lake, Nevada, and at the west foot of the San Francisco Mountains, in southwestern Utah. Its colors are the most pleasing in the genus.

The stomach of an individual from northwestern Nevada was filled with bodies and fragments of the large red ant which abounds in that region, which Dr. McCook identifies as the *Pogonomyrmex occidentalis*. Besides these there was a grasshopper, a *Pentatoma*-like hemipter, a small beetle, and several insect larvæ. The ant is evidently its principal food, and there is no scarcity of them in that arid region. Their sting is very severe, and the *Anota* must be proof against it to a degree much superior to that possessed by the (to him) gigantic mammal, man.

Dr. Stejneger remarks of this species as observed by the Death Valley exploring expedition:

Anota platyrhina inhabits the Lower Sonoran deserts of the Great Basin from California to Utah and ranges up a short distance into the Upper Sonoran. In California it was found in greater or less abundance in the Mohave Desert, in Owens, Coso, Panamint, Death, Mesquite, and Deep Spring valleys, and in the Argus, Funeral, and Panamint mountains (up to 1,740 meters or 5,700 feet on west slope northwest of Wild Rose Spring). In Nevada it was abundant in Sarcobatus Flat, the Amargosa Desert, Ash Meadows, Indian Spring, Pahrump, Vegas, Pahranaagat, and Meadow Creek valleys, and the valley of the Virgin and Muddy. In the northwestern corner of Arizona it was very abundant about the mouth of Beaverdam Creek and thence up on the west slope of the Beaverdam Mountains. In Utah it was common in the Santa Clara Valley ranging up through the sage brush to Diamond Valley and Mountain Meadows.

At Ash Meadows in the Amargosa Desert a very white form was found living on the white alkali soil.

Anota platyrhina Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
189	4	Salt Lake Valley		Stansbury	
190	3	do		Beckwith	
191	5	do		Bowman	
192	1	Head of Humboldt River		do	
9403	1	St. George, Utah		C. E. Johnson	Alcoholic.
8107	1	Fairfield, Utah		Dr. H. C. Yarrow	do.
4980	1	Salt Lake to Carson River, Utah		do	do.
8158	2	Arizona	—, 1871	do	do.
228	2	Fort Buchanan, Arizona		Lieut. F. T. Bryan, U. S. A	do.
9404	1	Exploration Colorado River		Lieut. J. C. Ives, U. S. A	do.
9405	5	Utah		C. McCarthy	do.
5344	1	Pyramid Lake, Nevada	May —, 1877	H. W. Henshaw	do.
9515	8	Fort Walla Walla, Washington	June —, 1881	Capt. Chas. Bendire, U. S. A	do.
10832	1	do	June —, 1881	do	do.
10833	1	Old Fort Cobb, Texas	—, 1879	Dr. E. Palmer	do.
11831	5	do	—, 1879	do	do.
11835	10	Nevada	—, 1887	Robert Ridgway	do.
11770	3	Virginia City, Nevada	July —, 1875	William Seckels	do.
8650	3	Mohave Desert, Arizona	July —, 1875	Dr. O. Loew	do.
9191	2	do	July —, 1875	do	do.
9195	1	do	—, 1875	do	do.
8649	2	Fort Mohave, Arizona		Dr. J. G. Cooper	do.
8651	1	Fort Whipple, Arizona		do	do.
9576	2	(?)		do	do.
11856	8	Fort Mohave, Arizona		do	do.
10785	10	Camp "12," Nevada	Oct. —, 1875	Dr. R. E. Lightburne	do.
10778	4	(?)	—, 1867	R. Ridgway	do.
11770	1	(?)		U. S. F. C.	do.
10782	1	(?)		do	do.
10781	1	(?)	—, 1878	do	do.
10836	1	(?)		do	do.
8107	2	Fairfield, Utah	—, 1872	Dr. H. C. Yarrow	do.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When collected.	From whom received.	Remarks.
			Feet.			
18363	Male ..	Virgin Valley, Arizona		May 10	Merriam	
18364	Male ..	do		do ..	do ..	
18365	Male ..	do		do ..	do ..	
18366	Male ..	do		do ..	do ..	
18367	Male ..	do		do ..	do ..	
18368	Male ..	do		do ..	do ..	
18369	Male ..	do		do ..	do ..	
18370	Male ..	do		do ..	do ..	
18371	Female ..	do		do ..	do ..	
18372	Female ..	do		do ..	do ..	
18373	Female ..	do		May 9	do ..	
18374	Male ..	St. George, Utah		May 13	do ..	
18375	Female ..	do		do ..	do ..	
18376	Female ¹	do		do ..	do ..	
18377	Female ..	Mountain Meadows, Utah		May 17	do ..	
18378	Male ..	Panaca, Nevada		May 19	do ..	
18379	Male ¹	do		do ..	do ..	
18380	Female ..	do		do ..	do ..	
18391	Male ..	Grapevine Mountains, Nevada		June 6	Nelson	4,200 feet above Salt Wells.
18382	Male ..	Lincoln County, Nevada		Mar. 12	do ..	Colorado River.
18383	Female ..	do		do ..	do ..	
18384	Male ..	Indian Spring Valley, Nevada		May 29	Bailey	
18385	Female ¹	do		do ..	do ..	
18386	Male ..	Pahrump Valley, Nevada		Apr. 29	do ..	
18387	Male ..	do		do ..	do ..	
18388	Male ..	Pahranaagat Valley, Nevada		May 25	do ..	
18389	Female ..	do		do ..	do ..	
18390	Male ..	do		do ..	Merriam ..	
18391	Male ..	Vegas Valley, Nevada		Mar. 9	Bailey	
18392	Male ..	do		do ..	Nelson ..	
18393	Male ..	Amargosa Desert, Nevada		May 31	Merriam ..	
18394	Female ..	do		do ..	do ..	
18395	Female ..	do		do ..	do ..	
18396	Female ¹	Ash Meadows, Nevada		Mar. 4	Bailey	

¹ Young.

Anota platyrhina Girard—Continued.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When collected.	From whom received.	Remarks.
			Feet.			
18397	Male	do		Mar. 3	Stephens	
18398	Male	do		Mar. 4	Palmer	
18399	Male	do		Mar. 20	do	
18400	Male	do		do	do	
18401	Male	do		Mar. 4	Nelson	
18402	Male	do		May 30	Merriam	
18403	Male ¹	do		Mar. 21	Fisher	
18404	Male	do		do	do	
18405	Male ¹	do		do	do	
18406	Male	do		May 30	Merriam	
18407	Male	Amargosa, Nevada		Mar. 8	Palmer	
18408	Female	Funeral Mountains, California		Mar. 16	do	1,000 feet above Borax works.
18409	Female	Argus Range, head of Borax Flat, California	3,000	Apr. 21	Stephens	
18410	Female	Water Station, head of Borax Flat, California		Apr. 22	do	
18411	Male	Death Valley, California	5,000	Apr. 3	Bailey	Panamint Mountains.
18412	Female ¹	Death Valley, Bennett Wells, California		Jan. 21	Palmer	
18413	Female	Death Valley, Furnace Creek, California		Jan. 30	Fisher	
18414	Male	do		Apr. 10	Stephens	
18415	Female ¹	10 miles from Reesting Springs, California		Mar. 17	Palmer	
18416	Male	Saline Valley, California	1,500	June 30	Nelson	
18417	Male	Panamint Mountains, Wild Rose Spring, California	5,300	Apr. 16	Bailey	
18418	Male	do	5,300	do	do	
18419	Female	do	5,300	do	do	
18420	Female	do	5,300	do	do	
18421	Female	Panamint Mountains, Willow Creek, California	5,000	May 16	Nelson	
18422	Male	Panamint Valley, Wild Rose Spring, California	4,500	Mar. 29	Bailey	
18423	Female	Panamint Valley, California		Mar. 27	do	
18424	Female	do		Apr. 20	do	
18425	Male	do		do	do	
18426	Male	do		do	do	
18427	Female ¹	do		Apr. 24	do	
18428	Female ¹	do		do	do	
18429	Male	Owens Lake, Ash Creek, California	3,700	May 29	Stephens	
18430	Female	Owens Valley, 10 miles north of Bishop, California	4,200	July 1	do	
18431	Male	Argus Range, Maturango Spring, California		May 6	Fisher	
18432	Female	do		do	do	
18433	Female ¹	do		do	do	
18434	Male	Argus Range, Coso Valley, California		May 11	do	
18435	Female ¹	Coso, California		May 19	Palmer	
18436	Male	Deep Spring Valley, California	5,400	June 9	Merriam	
18437	Male	Lone Pine, California		June 5	Palmer	
18438	Male ¹	do		June 7	do	
18439	Male	Independence, California		June 11	Bailey	
18440	Male	do		do	do	
18441	Male	do		June 18	Stephens	
18442	Female	Coyote Holes, 20 miles northeast of Daggett, California		Mar. 13	Palmer	
18443	Male ¹	Colorado Desert, Palm Spring, California		Sept. 27	Stephens	
18444	Female	(f)		(f)	(f)	Received from Death Valley Expedition, April 28, 1891.
18445		(f)		(f)	(f)	
18446	Male	Ash Meadows, Nevada		Mar. 4	Nelson	

Catalogue No.	Locality.	From whom received.
16505	Colorado Desert, California	C. R. Orcutt.
15872	Arizona	U. S. Fish Commission.
17922		C. M. Bryant.
21474	Sand Point, Idaho	U. S. Fish Commission.
21962-3	Coyote Wells, San Diego County, California	Dr. E. A. Mearns.
21964	Seven Wells, Salton River, Lower California	Do.

ANOTA MACCALLII Hallowell.

Anota m'callii HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1852, p. 182; Sitgr. Exped. Zuni and Color. River, 1853, p. 127, pl. x.—BOCOURT, Miss. Sc. Mex., Rept., 1874, p. 230.

Doliosaurus m'calli GIRARD, U. S. Expl. Exp. (Ch. Wilkes), Herp., 1858, p. 408; U. S. Mex. Bound. Surv. Rept., 1859, p. 9, pl. xxviii, figs. 4-6.

Phrynosoma maccallii COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 310.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 247.

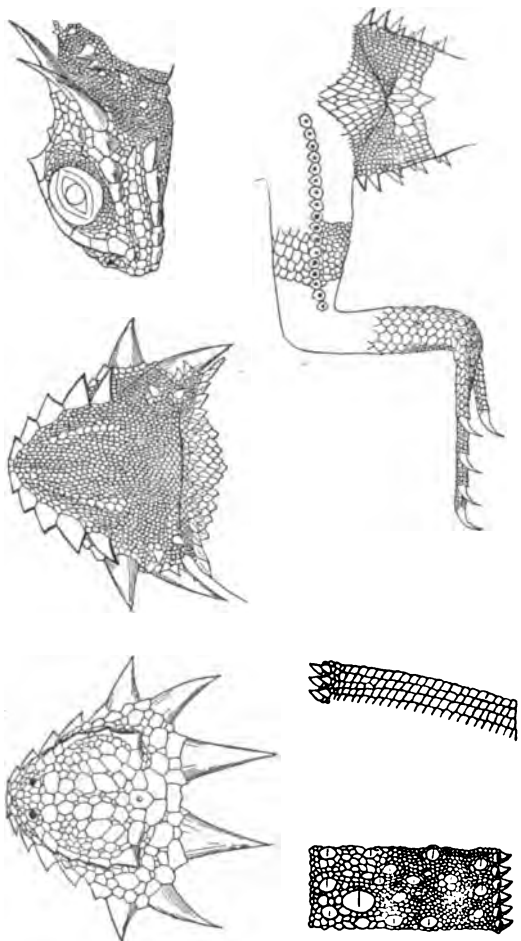


Fig. 82.
ANOTA MACCALLII HALLOWELL.

× 3.

Desert of Gila and Colorado.

Cat. No. 164, U.S.N.M.

Of this rare species, since the discovery of the type, the U. S. National Museum has received a male, a female, and a young one from the Colorado Desert of southeastern California. It is a very distinct species, and is so far known from a limited range only.

There are two lateral series of spiniform scales, of which the inferior is shorter at both extremities than the superior, the latter extending about three-quarters the length from the axilla to the groin. The

enlarged lateral gular scales are not very conspicuous, and form a short series. The occipital horns are long and acute. The internal temporals are half as long, and the external temporals are as long as the internal. They are directed nearly transversely, while the internal temporals are directed at an angle of 45° , and the occipitals more nearly posteriorly. The tail is broad and flat, and is bordered on each side by a fringe of rather closely placed spinous scales. Femoral pores numerous, in undivided scales. No accessory horns. Nares anterior.

The infralabial scales have anteriorly prominent angles, and are produced into short horns posteriorly. The scales of the head are larger than in most other species, and they are obscurely rugose to nearly smooth. There are five scales in a transverse row between the canthals on the anterior frontal angle. Of these the laterals are quite small, and the median three larger than in any other species, especially those on each side of the median. Supraoculars from two and three in a crossrow behind to four in front. Posterior superciliary angle not much produced, the penultimate superciliary scale not prominent nor even angular. Middle parietal region convex and not separated from the temporal region by an angle. Superior labials nine and ten to below the middle of the eye, forming a serrate border except anteriorly. In the temporal series of scales the one adjacent to the external temporal horn is very prominent, and the two anterior to it have apical angles.

The lateral cervical scales which are in line with the enlarged gulars (at a considerable distance) are only two or three in number, instead of forming the usual series, while the lateral cervical rosette above them is represented by a series of five or six large scales with basals. The ground scales of the back are flat, smooth, of various sizes, and generally broader than long. The enlarged scales are broader than long, keeled, and, except to a limited extent in one row, not free posteriorly. There is a row of the smaller of the keeled scales on each side of the middle line, which is quite regular. The largest scales form a widely spaced row just external to these. The other keeled scales diminish in size externally, and they do not form regular rows. They become more conic externally. Humerus and forearm covered with large keeled scales with free apices, except inferiorly. Scales of femur and tibia keeled and of diverse sizes, except on the concealed surfaces, where they are smaller, though generally similar. Scales of inferior surfaces smooth, except on the thorax, where they are faintly keeled and graduate into those of the humerus.

Extended hind leg reaching the axilla in female, or to the front of the humerus in male. Femoral pores 21-21 in the male, 18-17 in the female, in undivided scales. In the male there are 3-3 additional pores on an adjacent row of scales. Lateral scales of the toes produced, most on the external sides.

Measurements (Cat. No. 15955, male).—Total length, 108 mm.; length

to vent, 70 mm.; length to gular fold, 14.5 mm.; length of fore leg, 27 mm.; length of fore foot, 10 mm.; length of hind leg, 45 mm.; length of hind foot, 16.5 mm.; length of head to interoccipital border, 16 mm.; length of occipital horn, 7 mm.; length of internal temporal horn, 5.5 mm.; width of head (greatest), 25 mm.; width of head between superciliary angles, 12 mm.; width of body at middle, 31 mm.

The color above is light ashen, in the male with an orange tinge, which was no doubt much more distinct in the living than in the alcoholic specimen. A narrow median brown line extends from the parietal foramen to the rump. On each side of this are two rows of round brown spots or ocelli, as they have a pale interior and a brown central dot. These form three transverse rows, the anterior behind the axillæ and the posterior just anterior to the groin. The four longitudinal series are continued on the tail, where they are arranged transversely. Horns pale in the female, orange in the male. Head unspotted; limbs with obscure cross bands; inferior surfaces unspotted, except a short black line at the position of the omphalomesaraic fissure. The coloration is peculiar in the absence of the lateral cervical spots. There is no trace in the female, and a faint longitudinal shade well posterior to the head only in the male.

This peculiar species inhabits the Colorado Desert; it presents the usual character of desert species in its well-developed cranial spines. The scales, on the other hand, do not display this character, as they are less spinous than those of any other species, either of this genus or of *Phrynosoma*.

Anota maccallii Hallowell.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
15055	3	Fort Yuma, Arizona	U. S. Fish Commission	Alcoholic.

NYCTISAURA.

Nyctisaura GRAY, Cat. Liz. Brit. Mus., 1st ed., 1845, p. 5.

Nyctisaura COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 225.

Geckonoidea GILL, Smithsonian Report for 1885, 1886, p. 799.

Petrosal bone produced anterior to anterior semicircular canal, and not articulating above with the edge of the parietal. Clavicle expanded proximally. Olfactory lobes underarched by frontal bone. Epipterygoid present. Hemipenis calyculate. Teeth pleurodont.

The visceral characters of this superfamily resemble those of the *Pachyglossa*. There is a colon which mostly presents a cæcum, but the latter I did not find in *Sphærodactylus*. The right lobe of the liver is much produced, and the prolongation sends a process backward, which I have only observed elsewhere in the *Lacertidæ*. I found no corpus adiposum in *Thecadactylus*, *Phyllodactylus*, *Gonatodes*, or *Sphærodac-*

tylus, but it is present and free in *Eublepharis*. In *Sphærodactylus notatus* I observed the exceptional character of a distinct digitiform lobe of the liver on the left side, which partly embraces the stomach.

There are two families of this superfamily.

Vertebræ procelous; parietal bones united EUBLEPHARIDÆ.

Vertebræ amphicelous; parietal bones separate GECKONIDÆ.

These families are found in the warmer regions of both continents. The species which they include are of insectivorous habits. I have been able to examine the mesenteries in relatively few genera of the superfamily. I find the structure to be of the type most frequent in the Sauria; that is, a single hepatoventral; a single gastrohepatic; a left gastropulmonary, and a right hepatic, which embraces the right lung.

This superfamily is most nearly allied to the Diploglossa in its produced petrosal and papillose tongue. The form of the petrosal is very different, and the underarched frontals are very rare in that group, while the expanded clavicles are like those of the Leptoglossa in general.

GECKONIDÆ.

Geckotiens CUVIER, part, Règne Anim., II, 1817, p. 50.

Ascalabotæ MERREM, part, Syst. Amph., 1820, p. 39.

Geckotidæ GRAY, part, Ann. Phil. (2), X, 1825, p. 198.

Ascalabotoidæ FITZINGER, part, Neue Classif. Rept., 1826, p. 13.

Platyglossæ WAGLER, part, Syst. Amph., 1830, p. 144.

Ascalabotæ WIEGMANN, part, Herpt. Mex., 1834, p. 19.

Geckotiens or *Ascalabotes* DUMÉRIL and BIBRON, part, Erp. Gén., III, 1836, p. 237.

Ascalabotæ FITZINGER, part, Syst. Rept., 1843, p. 89.

Geckotidæ GRAY, part, Cat. Liz., 1845, pp. 5, 142.

Geckonidæ COPE, part, Proc. Am. Assoc. Adv. Sci., XIX, 1871, p. 236.

Geckonidæ BOULENGER, Ann. Mag. Nat. Hist. (5), XIV, 1884, p. 119.

Coronoid bone produced anteriorly and posteriorly on external side of ramus. Surangular wanting. Angular largely developed exteriorly, not interiorly. Splenial elongate; Meckel's cartilage covered between the splenial and internal mental foramina. Premaxillary broad, in contact with vomer. Pterygoids not touching sphenoid. Frontal arching under olfactory lobes. Parietal bones distinct; attachment of occipital segment very open; gomphosis internal. Petrosal with anterior vertico-oblique ring; superior plate produced beyond anterior semi-circular canal, forming abutment for columella. Postorbital osseous bars incomplete. Tongue papillose, no part retractile.

I have examined the hemipenis in the genera *Thecadactylus*, *Platydictylus*, *Phyllodactylus*, and *Gymnodactylus*. In these this organ is short and wide, appropriately to the fragility of the tail at a point just beyond the base. It is also more or less deeply divided into two branches. The entire surface is calyculate, generally minutely. In *Thecadactylus* each fork has three strong welts. In *Platydictylus* there is a welt opposite the sulcus, which is very large in *P. ægyptiacus*, and divides,

sending a half into each branch. In *Gymnodactylus pulchellus* the welts are not so heavy; below the bifurcation is a welt which incloses a circular area, which is incomplete proximad.

Boulenger gives the following interesting general account of this family:

The skull is generally much depressed, and its bones are thin. The nasals remain distinct; the frontal is either single or with distinct suture; the jugal is rudimentary, the orbit not being bound posteriorly by a bony arch; the supratemporal arch is likewise absent; the pterygoids are widely separated and devoid of teeth, and columella cranii is present. The mandible contains only five bones, the angular and articular being coalesced; the dentition belongs to the pleurodont type; the teeth are small, numerous, closely set, with long, slender, cylindrical shaft and obtuse point; the new teeth hollow out the base of the old ones. Only in a few instances does the derm of the head coalesce with the skull, and a supraorbital bone is present only in a few species of *Tarentola*. Both pairs of limbs are constantly well developed and pentadactyle. The clavicle is dilated and perforated proximally, and the interclavicle is subrhomboidal, or of a shape intermediate between that and the cruciform. The vertebræ are biconcave; the ribs are long, and so prolonged as to form more or less ossified hoops across the whole of the abdominal region.

The digits vary considerably, and afford excellent characters for systematic arrangement. Some Geckos (living in barren regions) have the digits similar to those of many Agamoids, i. e., they are subcylindrical or feebly depressed, and frequently keeled inferiorly or denticulated laterally; other forms with nondilated digits have them angularly bent at the articulations and provided with strong claws; but the greater number have the whole or part of the digits dilated into adhesive organs with symmetrical plates or lamellæ inferiorly, the arrangement of which varies considerably. Then, also, the claw may be retractile, either between some of the lamellæ or into a special sheath. Membranes may unite the digits, but the web serves only for the purpose of obtaining a greater adhesive surface, and never for swimming, none of the Geckos entering the water.

The body is generally more or less depressed, and may be bordered by cutaneous expansions, the object of which appears to be, in most cases, the same as that of the interdigital membrane; but in the curious genus *Pychozoon*, in which the lateral membranes attain the greatest development, they act as a parachute. The tail presents almost every possible shape from the leaf-like tail of *Gymnodactylus platurus* and the grotesque rudimentary tail of *Nephrurus* to the slender, rat-like tail of *Agamura* and the compressed crested tail of *Pristurus*. This organ is, except in *Agamura*, extremely fragile and rapidly reproduced, in which case, however, it generally assumes an abnormal shape and lepidosis. In some forms the tail proves to be prehensile, a faculty which is possessed by few lizards other than the Chameleons; and I am induced to believe that a careful examination of the Geckos, when alive, will show this character to be not unfrequent.

The eye is generally large and with vertical pupil, which, when contracted strongly, is frequently denticulated or assumes the shape of two superposed rhombs; some diurnal forms have the eye smaller and the pupil circular. The eye is exposed as in snakes, covered by a transparent lid under which it moves freely, the valvular lids being rudimentary; in *Elurosaurus*, however, there are connivent movable lids, and in *Ptenopus* the upper lid is sufficiently developed to cover the eye nearly completely.

The tympanum is more or less exposed, except in *Teratolepis*, in which genus it appears to be completely concealed under the scales. The tongue is fleshy, moderately elongate, very feebly incised anteriorly, and capable of protrusion out of the mouth.

The teguments are nearly always soft and consist generally of granules or tubercles on the dorsal surface, of small imbricated cycloid or hexagonal scales on the ventral surface. Some Geckos are entirely covered with scales of the latter description, which attain their highest development in *Teratoscincus*, *Teratolepis*, and *Geckolepis*.

The habits of the Geckos are highly interesting and deserve special attention, as but few observations have been made on them. Some inhabit arid regions, sometimes burrowing in the sand; others are arboreal, living on shrubs or in woods, concealing themselves under stones or under the bark of trees during the daytime; others live on rocks; others have become the commensals of man, and they again may be divided into two groups—those living inside, those living outside houses. Most are nocturnal, but some are diurnal. Colonel Tytler, in a very interesting paper on the habits of Geckos, observes that, "although several species of Geckos may inhabit the same locality, yet, as a general rule, they keep separate and aloof from each other; for instance, in a house the dark cellars may be the resort of one species, the roof of another, and crevices in a wall may be exclusively occupied by a third species. However, at night they issue forth in quest of insects, and may be found mixed up together in the same spot; but on the slightest disturbance, or when they have done feeding, they return hurriedly to their particular hiding places."

Many Geckos utter sounds, probably produced chiefly by a movement of the tongue against the palate, and in which *yecko*, *chucko*, *tockee*, or something similar is distinctly audible. A. Smith says that a South-African sand Gecko (*Ptenopus garrulus*) utters during the day a sharp sound somewhat like *chick, chick*; and he adds that the number thus occupied is at times so great, and the noise so disagreeable, as to cause the traveler to change his quarters.

The eggs are round and with a hard shell. Ovoviviparism has not been observed in this family. Males are generally distinguished from females by a larger size, the swelling of the base of the tail, and the presence of femoral or preanal pores, which are constantly absent in the latter.

The Geckonidæ are represented in the hotter parts of all the regions of the world. They are most numerous in the Indian and Australian regions.

The following synopsis of the genera is chiefly derived from Boulenger:

- I. Digits short, cylindrical, the skin swollen on the palmar surface and under the articulations.

Digits clawed; tail extremely short, terminating in a globular knob.

Nephrurus Günther.

No claws..... *Chondrodactylus* Peters.

- II. Digits straight, not dilated, clawed, without pads.

Digits granular inferiorly, not fringed laterally; rostral and mental plates projecting, nail-like..... *Rhynchadura* Günther.

Digits granular inferiorly, strongly fringed laterally; dorsal scales large, imbricate..... *Teratoscincus* Strauch.

Digits covered inferiorly with small imbricate pointed scales; dorsal scales small..... *Ceramodactylus* Blanford.

Digits inferiorly with a series of narrow transverse plates; toes strongly fringed laterally; fingers not fringed..... *Ptenopus* Gray.

Digits inferiorly with a series of narrow transverse plates, fringed or denticulated laterally..... *Stenodactylus* Fitzinger.

Digits inferiorly with a series of narrow transverse plates, not fringed nor denticulated laterally; dorsal scales juxtaposed; male with a series of preanal pores..... *Alsophylax* Fitzinger.

Digits inferiorly with a series of narrow transverse plates, not fringed nor denticulated laterally; dorsal scales imbricate; no preanal pores.

Homonota Gray.

III. Digits not or but slightly dilated at the base, the two or three distal joints more or less compressed and angularly bent, inferiorly with a series of transverse plates; all the digits clawed.

A. Claw between two scales, a smaller superior and a large latero-inferior.

Pupil vertical; tail fragile *Gymnodactylus* Spix.

Pupil vertical; tail very slender, not fragile *Agamura* Blanville.

Pupil round; body not depressed; tail compressed *Pristurus* Rüpp.

Pupil round; body more or less depressed; tail not compressed.

Gonatodes Fitzinger.

AA. Claw between three scales, a smaller superior and two large latero-inferior.

Upper and lower eyelids well developed, connivent; ungual scales forming a large compressed sheath *Elurosaurus* Boulenger.

No compressed ungual sheath *Heteronota* Gray.

IV. Digits dilated at the apex, which is furnished inferiorly with two plates separated by a longitudinal groove.

Digits not dilated at the base, clawed, the distal expansion covered above with scales strongly differentiated from those of the basal part.

Phyllodactylus Gray.

No claws *Ebenaria* Boettger.

Digits not dilated at the base, clawed, the distal expansion covered above with small tubercular scales similar to those on the basal part.

Diplodactylus Gray.

Digits dilated at the base, the basal expansion anteriorly with paired oblique lamellæ *Ædura* Gray.

Penultimate joint with an expansion bearing two plates exactly similar to the distal *Calodactylus* Beddard.

V. Digits dilated at the apex, which is furnished inferiorly with two diverging series of lamellæ; digits clawed, the claw sessile and retractile in the anterior notch of the distal expansion *Ptyodactylus* Cuvier.

VI. Digits entirely dilated, with a double series of lamellæ inferiorly, clawed, the claw sessile and retractile in the median groove. *Thecadactylus* Cuvier.

VII. Digits dilated, the distal phalanges compressed.

A. The distal joint long, free, rising from within the extremity of the digital expansion.

Infradigital plates in a double series; inner digit with compressed clawed phalanx; dorsal lepidosis composed of small scales or tubercles.

Hemidactylus Cuvier.

Infradigital plates double; dorsal scales large, imbricate.

Teratolepis Günther.

Infradigital plates in a simple series; inner digit with compressed clawed phalanx, similar to the other digits *Phyllopezus* Peters.

Infradigital plates in a simple series; inner digit clawed, the claw retractile laterally, inferiorly with a circular plate *Aristelliger* Cope.

Infradigital plates in a simple or double series; inner digit clawless.

Gehyra Gray.

Infradigital plates in a simple series; inner digit rudimentary, of fore limb clawless, of hind limb clawed *Perochirus* Boulenger.

AA. The free distal joint at the extremity of the digital expansion; a double series of infradigital lamellæ.

Pupil vertical; digits narrow at the base, the dilatation strong and discoid, the distal joint long and slender; inner digit rudimental.

Spalioescalabotes Boulenger.

Pupil round; eyelid distinct all round the eye; digits narrow at the base, the dilatation strong and discoid, the distal joint free; inner digit rudimental, with strong, very distinct claw.

Microscalabotes Boulenger.

Pupil round; eyelid distinct all round the eye; digits narrow at the base, the dilatation strong and discoid; the distal joint strongly curved, the claw retractile between the anterior lamellæ; inner digit rudimental, with very small, frequently indistinct claw. *Lygodactylus* Gray.
Pupil vertical; distal joint of digits short; thumb clawless.

Lepidodactylus Fitzinger.

AAA. The free distal joint at the extremity of the digital expansion; a single series of infradigital lamellæ.

1. The distal joint long.

Digits narrowing gradually toward the end, the narrower portion not forming an angle with the dilated basal part; eyelid distinct all around the eye *Nautilius* Gray

The slender distal portion of the digit forming an angle with the dilated basal portion. *Hoplodactylus* Duméril and Bibron.

2. The distal joint very short.

Digits more or less webbed, inner clawed *Rhacodactylus* Fitzinger.

Digits half-webbed, inner clawless *Luperosaurus* Gray.

Digits free or slightly webbed, inner clawless. *Gecko* Gray.

Digits entirely webbed, inner clawless. *Ptychozoon* Kuhl.

VIII. Digits entirely dilated, clawed, without compressed ungual phalanx, inferiorly with a single series of lamellæ.

Body covered with small imbricate scales *Homopholis* Smith.

Body covered with large imbricate scales *Geckolepis* Grandidier.

Body covered above with large juxtaposed scales, largest and subsymmetrical on the head *Eurydactylus* Sauvage.

Body covered above with granular scales; the claws of the three inner digits turned inward, those of the two outer turned outward.

Eluronyx Fitzinger.

IX. Digits dilated, only the third and fourth clawed *Tarentola* Gray.

X. Digits (the fingers at any rate) more or less dilated, clawless.

Pupil vertical; tips of toes dilated, with simple transverse lamellæ inferiorly.

Pachydactylus Gray.

Pupil vertical; tips of toes rather narrowed, with only two small lamellæ inferiorly *Colopus* Peters.

Digits dilated at the apex only, inferiorly, with transverse lamellæ furnished on their hinder edge with fine fringes *Dactylchilikion* Thominot.

Pupil circular; eyelid distinct all round the eye. *Phelsuma* Gray.

XI. Digits dilated at the apex only, with very small sheathed claw, the sheath opening laterally.

Digital expansion with transverse lamellæ inferiorly *Rhoptropus* Peters.

Digital expansion with a circular plate inferiorly. *Sphaerodactylus* Wagler.

The two genera which belong to our fauna may be very easily distinguished by the following characters:

Phyllodactylus.—Digits all terminated by triangular pallets or disks, with a longitudinal median groove beneath; claws exposed.

Sphaerodactylus.—Digits all terminated by circular disks, without central groove, and ensheathing the claws.

Both of these genera enter the Nearctic Realm at the borders only, the *Phyllodactylus* on the southwest and the *Sphaerodactylus* on the southeast, the former from the Mexican district and the latter from the West Indian district of the Neotropical Realm.

PHYLLODACTYLUS Gray.

- Phyllodactylus* WIEGMANN, *Herp. Mex.*, 1834, p. 20.—DUMÉRIEIL and BIBRON, III, 1836, p. 388.—FITZINGER, *Syst. Rept.*, p. 94.—GRAY, *Cat. Liz. Brit. Mus.*, 1845, p. 150; *Spicil. Zool.*, 1830, p. 3.—BOULENGER, *Cat. Liz. Brit. Mus.*, I, 1885, p. 76.
- Spherodactylus* WAGLER, *part. Syst. Amph.*, 1830, p. 143.
- Euleptes* FITZINGER, *Syst. Rept.*, p. 95.
- Discodactylus* FITZINGER, *Syst. Rept.*, p. 95.
- Diplodactylus* WIEGMANN, *part. Herp. Mex.*, 1834, p. 20.—FITZINGER, *Syst. Rept.*, p. 94.—GRAY, *Cat. Liz. Brit. Mus.*, 1845, p. 148.
- Parapura* GÜNTHER, *Ann. Mag. Nat. Hist.* (5), III, 1879, p. 218.

Digits all dilated at their extremity into a disk, which is perfectly smooth beneath, with a median furrow, all provided with distinct claws.

The phyllodactyles are easily known by the smoothness below of their digital disks and the distinct claws. Other characters, according to Duméril and Bibron, are the vertical pupil, the nostrils flared at the extremity of the snout, no second range of plates bordering the lower labials; the digits with transverse divisions beneath, posterior to the dilated portion.

Osteology.—In their osteology the species of this genus conform strictly to the Geckonid type as already described. I have before me the skeleton of *P. tuberculosus*, from which the following description is derived: The premaxillary is single and has a long superior spine; inferiorly it has the posterior border emarginate. Nasals elongate, distinct, emarginate posteriorly for the frontal. Frontal single, rather narrow, completely underarching olfactory lobes. Parietals distinct, wide, without pineal foramen, lying rather closely on supraoccipital, sending backward the parietoquadrate arch, which incloses a small foramen with the exoccipital. Supraoccipital distinguished from exoccipital by suture. Prefrontal narrow, forming the preorbital border to the middle above; no lachrymal; jugal represented by a splint which extends from the prefrontal to the extremity of the maxillary on the superior surface of the latter. Postfrontal a rather wide V-shaped bone, its longest limb extending posteriorly more than halfway to the base of the parietoquadrate arch. No postorbital. Quadrate with a single large, concave, external conch. Paroccipital in the usual position, splint-like.

Vomers in close contact throughout, with a common convex posterior border; an external longitudinal convexity of the inferior surface, and a groove on each side of the median suture, which divides a keel. Palatines short and wide, and with a longer vomerine than maxillary process, and curving downward below the level of the vomers. Narial orifices fissure-like except posteriorly and anteriorly, the external border with a dentate process of the maxillary bone directed posteriorly near the middle. Pterygoids much expanded anteriorly, forming with the ectopterygoids and palatines a thin plate, which closes up the palatine foramen; contracting rather rapidly posteriorly to the subcylindric rod-

like portion. Epipterygoid extending from the pterygoid at the basipterygoid process, and resting on the apex of the petrosal. Latter produced above anterior to semicircular canal; the anterior border continued into a crest which runs posteriorly above the trigeminal foramen. This terminates at the down-looking crest of the subforaminal portion, which bounds externally a wide down-looking groove. Basipterygoid processes long. Sphenoid distinct from basioccipital. Occipital condyle subequally divided into three parts, two prominent exoccipitals and a contracted basioccipital. The result is an apparently double condyle.

Mandible with the Meckelian groove closed, and with the splenial small and but little produced beyond the splenial foramen. Coronoid produced a little horizontally at the base. Angular not distinct; surangular and articular distinct. Angle simple, direct, spoon-shaped, with superior concavity. I have observed the following peculiarities in the otic and hyoid regions. There is no infrastapedial cartilage, and the suprastapedial and epistapedial cartilages are continuous. The hyoid system is characterized by the fact that the ceratohyal is attached to the paroccipital, which carries a cartilage on its extremity. There is a short second ceratobranchial, and no free epibranchial.

Vertebrae amphicœlous. Intercentra present throughout the vertebral column, continued into chevrons on the caudal region. Cervical ribs widened and truncate at extremities. In the specimen described the diapophyses of the second sacral vertebra are deeply longitudinally grooved on the inferior side so as to be nearly split. Diapophyses of anterior caudals elongate. Neural spines distinct but low throughout the column. In the scapular arch I note the following peculiarities. There is no proscapula, and the clavicle is much enlarged, and is perforate at the median extremity. The interclavicle is cruciform, with the angles filled up so as to have concave borders. It is coossified with the clavicle in *P. tuberculatus*, and extends but a little way posteriorly on the sternum. The coracoid has one large foramen. The sternum has no fontanelle. There are four hæmapophyses attached to the sternum on each side; and two to each of the slender closely approximated xiphoid rods. There are several very slender abdominal ribs.

The ilium has no *angulus cristæ*, and the acetabulum is entire. The pubes join at a little less than a right angle, and the pectineal processes are short and a little posterior to the middle. Pubes uniting at less than a right angle below, with the tuberosities distal.

The most distinctive feature of the skeleton of this genus is the presence of intercentra throughout the vertebral column, a point in which it resembles the extinct *Theromora* of the Permian epoch.

The American species of *Phyllodactylus* differ as follows:

- I. Tubercles larger and more numerous, keeled:
 - Abdominal scales in 30 transverse and 17 longitudinal rows; two postmentals and four scales behind them *P. ventralis* O'Shaughnessy.
 - Longitudinal series uninterrupted; abdominal scales in 30 transverse and 21 longitudinal rows; 3 postmentals and 6 scales in the row behind them.
 - P. juliæ* Cope.¹
 - Longitudinal series interrupted by scales; abdominal scales in 40 transverse and 25 longitudinal rows..... *P. tuberculosus* Wiegmann.
- II. Tubercles fewer, smaller, and not keeled.
 - Tubercles in rows; abdominal scales in 56 rows; 3 postmental scuta; disks larger..... *P. galapagoënsis* Peters.
 - Tubercles in rows; abdominal scuta in 56 rows; 4 postmentals; disks very small..... *P. microphyllus* Cope.
 - Tubercles not in rows very distinct; mental large; 1 postmental; disks large; cross-banded..... *P. nigrofasciatus* Cope.
 - Tubercles not in rows, more obscure; abdominal scuta in 50 rows; two or three postmentals; disks larger; cross-banded..... *P. inæqualis* Cope.
- III. Tubercles wanting.
 - Dorsal scales in 36 rows; larger than those of muzzle, which are but little larger than those of occiput; 5 cross-bands between axilla and groin.. *P. unctus* Cope.
 - Dorsal scales one-fourth as large as those of belly, minute; reddish-brown, darker speckled *P. leei* Cope.

Of the above species but two, the *P. tuberculosus* and the *P. unctus*, are found within the limits of the nearctic realm, and these only in its extreme southwestern regions. Besides them, Boulenger records five species from Africa and Madagascar, five from Australia and adjacent islands, and one from the islands of the Mediterranean Sea west of Italy. *P. galapagoënsis* and *P. leei* are natives of the Galapagos Islands, and *P. microphyllus*, *nigrofasciatus* and *inæqualis* are from western Peru. *P. juliæ* is from Aruba, and *P. ventralis* from Nicaragua (Boulenger).

PHYLLODACTYLUS TUBERCULOSUS Wiegmann.

Phyllodactylus tuberculosus WIEGMANN, Nova Acta Acad. Leop.-Carol., XVII, 1835, p. 241, pl. XXIII, fig. 2.—DUMÉRIL and BIBRON, Erp. Gén., 1836, III, p. 396.—GRAY, Cat. Liz. Coll. Brit. Mus., 1845, p. 150.—AUG. DUMÉRIL, Cat. Méth., Coll. Rept. M. P., 1851, p. 40; Arch. Mus., 1856, VIII, p. 465.—BAIRD, U. S. Mex. Bound. Sur., 1859, p. 12, pl. XXIII, fig. 1-8.—BOCOURT, Miss. Sci. au Mex. Rept., 1873, p. 43, pl. x, fig. 3.—O'SHAUGHNESSY, Ann. Mag. Nat. Hist. (4), XVI, 1875, p. 262.—BOULENGER, Cat. Liz. Brit. Mus., 1885, I, p. 79.

Phyllodactylus tuberculatus GRAY, Cat. Liz. Brit. Mus., 1845, p. 150.

Discodactylus tuberculosus FITZINGER, Syst. Rept., 1843, p. 96.

Phyllodactylus xantii COPE, Proc. Acad. Nat. Sci. Phila., 1863, p. 102.

Back with ten or twelve series of large trihedral tubercles among the smaller granulation. A large mental plate, acutely angled behind. Hind leg contained nearly two and one-half times in head and body, reaching forward halfway to the eye. Hind foot about as long as the tibia; contained seven times in the head and body. Head to ear contained three and one-fifth times in head and body.

¹ *P. Martini* Van Lidth de Jeude, Notes Leyden Mus., IX, p. 130.

The nostril is situated in the middle of one plate with a narrow rim, which is encircled by five others, instead of being a mere pit between in the angle of four plates, one of them the first labial. The scales are much finer on the back and coarser on the belly. The limbs are shorter. The central line of scales beneath the toes is wider and less angular. The hook on the side of the base of the tail is represented in the type by numerous smaller scales. Above, light brownish or reddish yellow, with a series of transverse blotches of darker on each side (about eight or ten). A few seen on the tail. Beneath, uniform whitish.

Head and body much depressed; the neck somewhat contracted. The ears are small and crescentic. The eyes are very large; the eyelids annular and apparently not capable of covering the eye. The bony ring of the sclerotica is composed of many plates, as in birds. The nostrils are small, very far forward, and situated so close to the low rostral as to appear partly excavated in it. They are placed just above the junction of the rostral and first labial, with ten plates between them and touching the rostral. Behind them and against these internasals is another plate, smaller than the latter; another tubercular plate still smaller and like the others behind it completes the border. The head is injured so that the labial plates can not be readily distinguished, but there are apparently eight or nine upper, the posterior becoming smaller and four or five lower, becoming smaller behind and then changing to a double series of tubercles. The end of the lower jaw is formed by

a large, long plate, acutely angular behind, with a large subpentagonal arc between it and the first labial. Behind this the plates become subhexagonal and diminish gradually in size to the general average, occupying a patch extending as far as opposite the fourth lower labial and bordered behind and laterally by small plates. Those bordering the lower labials are not much larger than those on the back part of the chin, similar ones covering the upper part of the head, as far as to the posterior borders of the orbit. The rest of the head above, the back and sides, with the throat, are covered with small, approximated granules, with much larger conical or trihedral ones interspersed. Of these the back exhibits about ten regular series, five large ones on each side of the median line, with an additional row of smaller ones on each flank. The belly is completely and regularly covered with smooth subhexagonal scales arranged in quincunx, although but little imbricated. Of

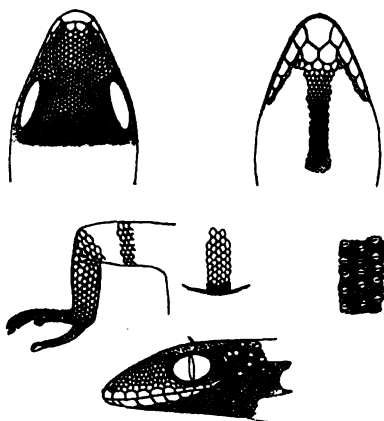


Fig. 83.

PHYLLODACTYLUS TUBERCULATUS WIEGMANN.

× 2.5.

La Paz, Lower California.

Cat. No. 12646, U.S.N.M.

these there are about 31 or 32 in an oblique series across the belly. They extend from the throat to the tail and quite similar ones are to be seen on the entire inferior surface of the hind legs and the anterior of the front legs; the latter more convex.

The upper surfaces of the legs are like the back, but the tubercles are less regular. The posterior face of the arm and femur over the sides, except above, are covered with uniform small scales, those on the femur being abruptly smaller behind than inferiorly.

The legs are short, the hinder especially. The digits are all nearly equal, increasing in length from the first to the third, which is about equal to the fourth and fifth. They are connected at the base by a web. They are depressed, their under surface with a series of short, transverse, rather tubercular lamellæ, and they terminate in a flattened obcordate or subquadrate expansion, which is perfectly smooth and flat beneath, with a central longitudinal groove, and emarginate or cordate at the end, to receive the point of the sharp, apparently retractile, claw.

The tail is cylindrical, thickened, but attenuated at the end, and not quite as long as the head and body; it is contracted at the base and covered pretty regularly with small scales in indistinct whorls, and about as large as those on the belly. The under surface, however, is occupied by a series of broad transverse plates, beginning a short distance behind the anus. On the upper surface, too, are four rows of the large tubercles, continued from the arch, on as many slight ridges, separated by furrows, the central of which is the largest. The tubercles of each series are separated by an interval of about three of the smaller scales. On each side the base of the tail and above the anus is an oblique series of three spinous tubercles. There are two exposed cavities behind the anus (containing the penes?), but there are no femoral or preanal pores.

This specimen sufficiently resembles the species described by Wiegmann to belong to it, except that the ventral scales are smooth, not carinated, and uniform, not mixed with smaller ones.

Phyllodactylus tuberculosus Wiegmann.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
12846	1	La Paz, Lower California.	Feb. —, 1882	L. Belding.....	Alcoholic.

Besides the above locality, the city of Chihuahua yielded a specimen to E. Wilkinson. It is abundant in southern and western Mexico.

PHYLLODACTYLUS UNCTUS Cope.

Phyllodactylus unctus BOCOURT, Miss. Sci. de Mex. Rept., 1873, p. 43.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., I, 1885, p. 94.—COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 28.—VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, V, p. 86.

Diplodactylus unctus COPE, Proc. Acad. Nat. Sci. Phila., 1863, p. 102; 1866, p. 312; Bull. U. S. Nat. Mus., No. 1, 1875, pp. 50, 93.—STREETS, Bull. U. S. Nat. Mus., No. 7, 1877, p. 35.—YARROW, Bull. U. S. Nat. Mus., No. 24, 1883, p. 73.—S. GARMAN, Bull. Essex Inst., XVI, 1884, p. 12.—BELDING, West Amer. Scientist, III, 1887, p. 98.

Scales rounded, flat; in about 36 rows on the dorsal region; those of the muzzle smaller than dorsal, little larger than those of the occiput. Internasals in contact. Seven superior labials, including that under the pupil; six inferior, to the same point, the last two very small, the first larger than the second, extensively in contact with the first pair of mental plates, which bound the symphyseal posteriorly. Each of the former is bounded by three smaller, and these are succeeded by a few rows which diminish in size. Terminal disks with straight outlines. Tail without tubercles. Anal scales similar to the abdominal. Auricular opening as long as pupil. Premaxillary teeth five. Above gray, shining, with five broad, blackish, centrally pale cross bands, from base of tail to interscapular region; a dark band from the muzzle through the eye, a cross band on occiput, and various irregular spots on the top of head and labial regions. Length from end of muzzle to auricular meatus, 25mm; from the same point to vent, 110mm.

Mr. Van Denburgh,¹ of San Francisco, who has seen more specimens of this species than any other person, thus writes of the variations in its coloration:

There is great variation in the coloration of the head and back. In some specimens it is pale gray or creamy white, while in others the prevailing tint is a dark seal-brown. There are, however, some fairly constant markings brighter in young than in old individuals, but apparently subject like the ground color, though to a less extent, to modification, in accordance with the amount of light, or perhaps in obedience to the will of the animal. These markings are of a deeper seal-brown than the ground color of the darkest individuals. A line originates on the second labial plate and, passing through the eye and the upper ear-opening, runs for some distance along the neck. The upper surface of the head is blotched and spotted, as are also the limbs. The tail has about nine crossbars on its upper surface. All the lower surfaces are creamy white, slightly tinged with brown in the darkest specimens. The scales are everywhere minutely punctulated over with dark brown.

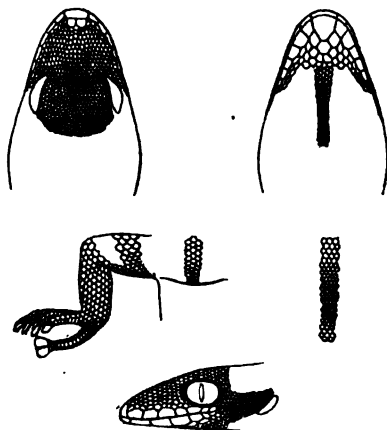


Fig. 84.

PHYLLODACTYLUS UNCTUS COPE.

× 3.

Triunfo, Lower California.

Cat. No. 8511, U.S.N.M.

Phyllodactylus unctus Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
5304	1	Cape St. Lucas, Lower California.		John Xantus	Type: alcoholic.
8571	3	Triunfo, Lower California.	—, 1874-75	Dr. T. H. Streets, U. S. N.	Alcoholic.
12612	1	La Paz, Lower California.	Feb. —, 1882	L. Belding	do.
15892	1			U. S. Fish Commission	do.

¹Proceedings, California Academy of Sciences, 1895, V, p. 86.

SPHÆRODACTYLUS Wagler.

Sphærodactylus WAGLER, Syst. Amph., 1830, p. 143.—BOULENGER, Cat. Liz. Brit. Mus., I, 1885, p. 217.

Sphærodactylus GRAY, Griff. Anim. King. Syn., p. 52.—WIEGMANN, Herp. Mex., 1834, p. 20.—DUMÉRIl and BIBRON, III, 1836, p. 401.—BOCOURT, Miss. Sc. Mex. Rept., 1873, p. 44.

Sphærodactylus FITZINGER Syst. Rept., 1843, p. 93.—GRAY, Cat. Liz., 1845, p. 168.—COPE, Proc. Acad. Nat. Sci., Phila., 1861, p. 497.

Digits subcylindrical, without claws; expanded at their extremity into subcircular pads; smooth, and not grooved beneath.

The Sphærodactyles are easily distinguished from the Phyllodactyles by the absence of any median groove on the surface of the terminal disks of the digits. They differ in other points of organization, though more nearly related to them than to the other Geckonidæ.

The species described by Duméril and Bibron all appear to have the scales of the dorsal surface small, granular, or else with those along the middle of back smaller than the layer on either side. The single one inhabiting the United States (Key West), on the contrary, has the scales of the upper surface large, equal, strongly carinated, and larger than the ventral. The *S. richardsonii* of Gray has the same character, but differs in coloration.

SPHÆRODACTYLUS NOTATUS Baird.

Sphærodactylus notatus BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 254; U. S. Mex. Bound. Sur., Reptiles, p. 24, pl. XXIV, figs. 29-37.—COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 500.—BOULENGER, Cat. Liz. Brit. Mus., I, 1885, p. 226.

Scales on back and sides large, equal, strongly carinated and acute; those on belly rather smaller, smooth, hexagonal. Tail cylindrical. The head is about half the body alone; the tail equal to both together. The hind leg is contained about two and two-thirds times in head and body; the hind foot about 6 times. The upper parts are light-brownish yellow, covered rather distantly, but quite uniformly, with small circular spots of reddish brown, conspicuously so on the whole head; scarcely seen on the belly; on the breast they almost seem arranged in regular lines. Head broad and acutely pointed, depressed; width about two-thirds the length to ear. Rostral consisting of a large triangular plate forming the entire end of the muzzle. The nostril opening in its posterior margin over the junction of the first labial, bordered above by a slight shell. Behind the rostral are two triangular plates meeting internally by an acute angle, and coming by the antero-exterior angle in contact with the lateral rostral. There are three large upper labials, the first largest, the second between this and the third; posteriorly are two or three much smaller. There is a very large mental plate like the rostral, and forming the end of the jaw; on each side of this is one very large lower labial corresponding to the first and second upper; then two smaller ones. There are no plates under the lower labials larger than those on the chin. There is a shallow depression in the

hinder part of the rostral, divided longitudinally by a shallow groove, and possibly indicating a fusion with an internasal or nasal plate. The eyes are very large and much exposed; the eyelids appear to be annular, the lower entering completely within the orbital cavity. The ears are very small and circular.

The head and upper part of neck, except as described, are covered with uniform tubercles, which become a little larger anteriorly. The upper parts and sides of body are covered with quite large, imbricated, acute, angular, and strongly carinated scales, of which there appear to be about thirty across back and sides. On the belly the scales are a little smaller, hexagonal, and smooth—about twenty in an oblique series. About fifteen ridges may be counted above between the hind legs. The scales in front of the pubes are coarser, thicker, and more tubercular than more anteriorly. The scales above and behind the fore leg, on the side of the neck, in front of the hind leg, and on the posterior face of

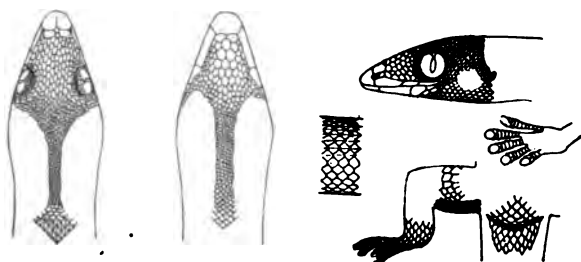


Fig. 85.

SPHÆRODACTYLUS NOTATUS BAIRD.

× 2.

Florida.

Cat. No. 3216, U.S.N.M.

fore leg and of thigh are small, even, and granular, like those back of the head. The upper and outer surfaces of the legs are covered with large, acute, carinated scales. The tail is cylindrical, as long as body (alive), constricted at base, and finely whorled, the scales in under surface broader. There are no pores about the anus nor spines at the base of tail, as far as can be perceived. The legs are short, the digits broad, depressed, and without any claws, each one expanded at the end into a plain circular subhemispherical depressed pad, plane on the under surface; the digits anterior to this transversely lamellated.

This species in its large and strongly carinated scales, about of equal size, differs widely from all those described by Duméril and Bibron, but approaches the *S. richardsonii* of Gray.¹ The colors, however, are entirely different.

Specimens from Cuba collected by Charles Wright are very similar in character generally, but appear to have a more slender head and

¹ Catalogue of the Lizard Collection in the British Museum, p. 168. From "America."

more obtuse muzzle, with larger plates above it. The coloration is the same in some, but in others the head. There is a dusky line along the top of head, and three from behind the eye, a middle one, broadest, passing above the ear, an inferior passing below it, and a short one above the rest. The line on top of the head bifurcates at the occiput and with the others is continued indistinctly along the body. There is also a line from nose to eye.

Sphærodactylus notatus Baird.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3216	1	Florida		Alcoholic.
5173	1	Cuba	C. Wright	do.

This species occurs also in the Bahama Islands. Its occurrence in Florida has been so far very seldom observed.

EUBLEPHARIDÆ.

Geckonidæ, part, of most authors.

Eublepharidæ BOULENGER, part Ann. Mag. Nat. Hist. (5), XII, 1883, p. 308; (5), XIV, 1884, p. 119.

Except in the procoelian vertebræ and the single parietal bone, the skeleton is similar to that of the preceding family, to which the Eublepharidæ are affined. The teguments are also very similar, and of a soft kind, the upper surfaces are covered with small scales or granules, which are usually intermixed with enlarged tubercles, and the lower surface of the body with small cycloid imbricated scales. The skin of the head is free from the skull. The eyes are moderately large, with elliptico-vertical pupil, and are protected by thick, movable, connivent lids. The nostril is rather large, directed slightly upward, though lateral, and separated from the rostral and labial plates. The tympanum is exposed. The limbs are weak and the digits short and cylindrical; they are all provided with a small, sharp, retractile claw which, in *Coleonyx*, is entirely concealed in a much-developed, compressed sheath; this sheath, which differs only in size according to the genera, is composed of two lateral plates, the superior suture of which is covered by a third narrower one, a structure which we have already met with in the Geckoid genus *Ælurosaurus*. As in the Geckos, the tail is extremely fragile. Males have preanal pores, forming an angular series.

Three species are natives of Central America, one of the southern parts of the United States, two of southern Asia, and one of West Africa; the genus *Eublepharis* occurs in America as well as in Asia. This extraordinary distribution seems to indicate that the few representatives of this small family are the remnants of some ancient, more generally dispersed group; it nevertheless remains a matter of wonder how forms now so widely separated have retained so great a resemblance, not only in structure but also in the pattern of coloration. (Boulenger.)

SYNOPSIS OF GENERA.

Claws partly exposed; lower surface of digits granular.....*Hemitheconyx* Stejneger.
 Claws partly exposed; lower surface of digits lamellar.....*Eublepharis* Gray.

Hemitheconyx has one species, which is West African. *Eublepharis* has six species, of which two are from India, three from Central America and Mexico, and one from the Southwest of the United States.

EUBLEPHARIS Gray.

Eublepharis GRAY, Phil. Mag; II, 1827, p. 56; Zool. Journ., III, 1828, p. 223; Cat. Liz., 1845, p. 170.—WAGLER, Syst. Amph., 1830, p. 143.—FITZINGER, Syst. Rept., 1843, p. 90.—GÜNTHER, Rept. Brit. Ind., 1864, p. 119.—BOULENGER, Cat. Liz. Brit. Mus., I, 1885, p. 230.

Gymnodactylus WIEGMANN, part, Herpt. Mex., 1834, p. 19.

Coleonyx GRAY, Ann. Mag. Nat. Hist., XVI, 1845, p. 162.—BOCOURT, Miss. Sci. Mex. Rept., 1873, p. 49.—BOULENGER, Cat. Liz. Brit. Mus., 1885, 2d ed., I, p. 234.

Brachydactylus PETERS, Monatsber. Berl. Akad., 1863, p. 41.

Belly covered with regular small hexagonal scales; rest of body and head (except on edges of mouth) covered with small regular granules, sometimes mixed with larger scales. Jaws each margined with a single series of labial plates, the granules margining these a little larger. Eyelids much developed; pupil vertical. External ear distinct. A short spine at each side of the base of the tail. Tail cylindrical all round, with very short whorls of small square plates constricted at base. Digits conical, not dilated; denticulated along the edges beneath with two or three series of transverse tubercles, the central largest and lamellar. Claws very small, not retractile, partially concealed by two lateral and one superior scale. First digit not opposable to the others. No crests or folds of skin. Skin of body very loose. No palatine teeth. Jaw teeth straight, conical-truncate, and pleurodont. Hind feet shorter than tibia. Male with preanal pores.

Dr. Boulenger¹ distinguishes the *E. elegans* Gray, of Mexico and Central America, as the type of a distinct genus *Coleonyx*, following Gray, on the ground that the claws are completely concealed in the latter. I find the characters of the *E. elegans* and the *E. variegatus* to be identical in this respect, and so can not separate them generically.

Anatomy.—Owing to the isolated position of this genus, its osteology is worthy of especial attention. The premaxillary is undivided, and has a long superior spine, but no inferior spine. The nasals are distinct. The frontals are coossified, and the interorbital space is very narrow. The parietals are coossified, and there is no pineal foramen. The supraoccipital is loosely articulated anteriorly, but is coossified with the exoccipitals. No lachrymal bone; prefrontal large, but not reaching far posteriorly over orbit. Postfrontal small, crescentic; no postorbital. No postorbital or supratemporal arches. Parietoquadrate arch de-

¹ Catalogue, Lizards of the British Museum, I, 1885, p. 234.

pressed; paroccipital lying over the parietal at the inferior extremity. No jugal bone. No orbitosphenoid; the olfactory lobes inclosed below by the frontal bone. Petrosal produced beyond semicircular canal at the superior anterior angle, and without the oblique crest such as is characteristic of the Geckonidæ. A subforaminal projection and groove, the external wall of the groove as prominent downward as the internal, so that the groove is open inferiorly. Vomers swollen, separated for most of their length by a deep groove. Palatines short and wide, sending a postnarial process to the maxillary. Pterygoids broad and flat in front, narrower posteriorly, with a short ectopterygoid without descending angle, inclosing a maxillopalatine foramen. Basipterygoids elongate. Sphenoid and basioccipital distinct; the latter distinct also from exoccipitals. Occipital condyle convex, without exoccipital portion. Epipterygoid oblique, articulating below posterior to ectopterygoid process of pterygoid and above with petrosal only. Quadrate straight, oblique, with a single conch, which is external to the rod-like axis; condyle emarginate. In the mandible the angular bone is small but distinct, and the coronoid is produced much farther anteriorly than posteriorly on the external face of the ramus. The dentary extends to about opposite the middle of the coronoid on the external face of the ramus. The splenial extends posteriorly but not anteriorly. The Meckelian groove closed. In the hyoid apparatus all the elements are present, including a pair of elongate second ceratobranchials. There is a free process of the ceratohyal anterior to its junction with the hypohyal.

The scapular arch is much like that of the Geckonidæ. The clavicle is expanded and perforate proximally. The interclavicle is subcruciform, with the limbs connected by laminate expansion. There is a small proscapula which is connected at its apex with the epicoracoid. Coracoid with one large emargination. Sternum without fontanelle, supporting three ribs and a xiphoid rod, which supports but one rib. No abdominal ribs.

The hemipenis is closely similar to that of the Geckonidæ. It is short and deeply bifurcate. It has a single prominent welt. The surface of this is smooth, but the remainder of the surface is calyculate.

EUBLEPHARIS VARIEGATUS Baird.

Eublepharis variegatus BOULENGER, Cat. Liz. Brit. Mus., I, 1885, p. 233.

Stenodactylus variegatus BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 254; U. S. Mex. Bound. Surv., Rept., 1859, pls. XXIII, figs. 9-27; xxiv, figs. 11-19.—BOCOURT, Miss. Sci. Mex., Rept., 1873, p. 51.

Coleonyx variegatus COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 125; Bull. U. S. Nat. Mus., No. 17, 1870, p. 13.

Head very broad, about one-fourth the head and body. Hind foot contained six times in head and body. Above brownish or grayish yellow, with irregular small blotches of light reddish brown, or else with broad transverse bands from head to tail. Edges of jaw and

rostrum with a few brown blotches. Edges of eyelids and whole under surfaces opaque white.

Body everywhere (except on the belly) covered with perfectly uniform, excessively minute, rounded tubercles or granular scales, much too small to be appreciable by the naked eye; they are, however, rather smaller on the head all round. The lateral granules change gradually on the belly to rhombic, imbricated, carinated scales, arranged regularly in quincunx and becoming a little larger to the center. They begin on the lower part of the throat and cover the under surface of the hind legs; they are a little larger than elsewhere between the insertion of the hind legs. The tail is occupied by a succession of short whorls of nearly equal square scales as large as those on the belly, the inferior ones largest. The ear opens abruptly as an oval deep cavity. There are no palatine teeth. The only plates on the head consist of those margining the jaws, consisting of a large, nearly equal rostral and mental and about 9 labials (upper and lower each), the posteriors smaller. These are margined by scales rather larger than the average of those on the head. The annular nostril is in the center of a small plate with narrow edges, placed above the junction of the rostral and the first labial. It is margined behind by two rather square plates, and anteriorly by a long, narrow one applied against the rostral. The orbits are large, the eyelids very full, continuous, and uniform with the supra- and infra-orbital region. Each has a series of narrow quadrate plates on its edge.

The toes have no lateral pallels, but are conical, tapering to the claws, although depressed and slightly denticulated laterally. Beneath they are covered with transverse tubercles arranged in two or three longitudinal series, the central widest. The claws are very small, quite straight, slender, and apparently not retractile; they are scarcely visible in a sheath of scales. The fingers are long and nearly equal, the first and fifth reaching opposite the same point—the penultimate articulation of the third. The fourth toe is longest; the third and second successively shorter by about a claw; the fifth about equal to the first and much shorter than second. The hind foot is about as long

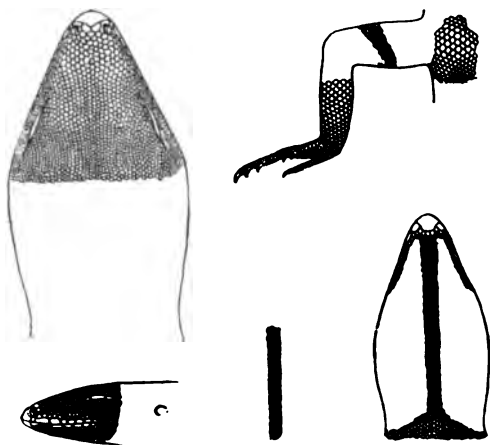


Fig. 86.

EUBLEPHARIS VARIEGATUS BAIRD.

a, $\times 3$; b-e, $\times 2$.

Helotes, Texas.

Collection of E. D. Cope.

as the tibia. On each side of the base of the tail is a short depressed spine curved a little upward and forward like a spur; and just behind the anus, but exterior to it, and almost covered by the anal flap, are two quite large ones, frilled with a membranous substance.

A second series of specimens (Cat. No. 3213), probably the males of the preceding, from Camp Yuma, differs from that just described in having a series of well-defined preanal pores in the centers of six or seven large circular scales between the centers of insertion of hind legs. The pits behind the anus appear filled with erectile tissue, probably the penis, as the space behind is much swollen or subglobular, with a median longitudinal depression and a deep constriction behind it, beyond which the tail with the larger scales begins at a distance of about twenty one-hundredths of an inch from the anus. This is very different from the majority of lizards where the tail comes close up to the anal slit.

It may be that the specimens with preanal pores (Cat. No. 3213) are really of a different species from the typical ones without them. The central row of tubercles beneath the toes is wider and more transversely lamellar than in the type specimen.

The head is large and broad; convex above and ovate; the width about two-thirds the length. It is contained (from snout to ear) a little more than four times in head and body. The hind legs extended forward twice, reach nearly to the eye, and are contained about two and one-half times in head and body. The hind foot alone is contained six times in head and body.

The color in Cat. No. 3217 is a light brownish yellow above, with small rounded reddish-brown blotches irregularly distributed. The edges of the eyelids, the nostrils, the tip of rostral, a spot in front of the orbital region, and ten spots on each side of upper jaw are white; the rest of upper labials and tip of rostrum reddish brown, like the dorsal blotches. The under parts are opaque silvery white.

In another series which appears identical with the preceding, though of smaller size, the ground color is brownish yellow, but the back is crossed by six or seven broad bars of olivaceous brown, about equal to each other and to their interspaces. These are continued on the tail as five or six rings interrupted below, the borders considerably darker than the centers. The most anterior bar covers the whole head behind the eye. The anterior portion of the head likewise is quite similar, with a U-shaped light mark above the anterior corner of the eye (the concavity anterior), a square spot in the rostral and one around and behind the nostril. The labials are yellowish, with a dusky spot on the end of the lower jaw and another crossing both jaws at about the fourth and fifth labials. The chin is slightly blotched.

Eublepharis variegatus Baird.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3211	1	Live Oak Creek, Texas	Maj. W. H. Emory, U. S. A. .	Alcoholic type.
3213	2	Fort Yuma, California.....	Maj. G. H. Thomas, U. S. A .	Alcoholic.
22388	1	San Antonio, Texas	H. and E. Crimley	
14795	1	Tucson, Arizona	Herbert Brown.....	
15787	1	do	do	
16808	1	Nogales, Arizona	P. L. Jouy	
19795	1	Cañon del Oro, Pinal County, Arizona.	Horace F. Collins.....	
20962	1	Gila Bend, Arizona	Dr. M. M. Crocker	

This very pretty lizard is the only species of the Eublepharidæ thus far found in Texas. Both the banded and spotted forms occur. I found both rather abundant in the rocky hills of the first plateau northwest of San Antonio, but did not observe it in that region north of that point either on the Guadalupe or Llano rivers. It is found in holes under stones toward evening, and generally in pairs—a peculiarity I have not observed in any other lizard. Its manners are also peculiar. It carries its thick tail coiled vertically on one side of its back, like the spitz dog. Its movements are quick but feeble, and its short legs forbid the speed of other lizards. *Eublepharis* has large, thick eyelids, and as their movement in winking is slower than in other lizards the physiognomy is quite peculiar. When handled this species chirrup and squeals feebly like a singing mouse. One specimen which I took was about to shed its skin, so I placed it in a jar to observe the process. This took place in the night, for next morning it was so clean and its color so bright that it looked as though gotten up for some special occasion. As no trace of the skin could be found, I suppose that it ate it, after the manner of the Batrachia. In life the colors are very elegant; the pale crossbands are citron yellow and the brown ones bright chestnut. The inferior surfaces and all parts of the limbs are flesh or rose color.

UROPLATOIDEA.

Uroplatoidea GILL, Smithsonian Report for 1885, 1886, p. 799.

Geococcarani COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 25.

Petrosal bone produced beyond anterior semicircular canal and not articulating above with the edge of the parietal. Olfactory lobes underarched by the frontal bones. Clavicle proximally simple. Vertebrae amphicelous. No supratemporal arch. Tongue papillose.

But one family of this superfamily is known, which is defined as follows:

Dentition pleurodont, parietals distinct; postorbital and postfronto-squamosal arches wanting; interclavicle minute; nasal bones united; tip of tongue not retractile; occipital condyle divided UROPLATIDÆ

UROPLATIDÆ.

Geckonidæ, part of most authors.

Uroplatidæ BOULENGER, Ann. and Mag. Nat. Hist. (5), XIV, 1884, p. 119.

The following description is from Boulenger:

Tongue moderately elongate, simply papillose, slightly nicked anteriorly. Dentition strictly pleurodont; teeth numerous, small, obtusely conical, with long cylindrical shafts. No pterygoid teeth. Skull thin, much depressed. A rather strong ligamentous postorbital arch; no fronto-squamosal arch; premaxillary single; nasal single; frontal single; parietals two. Vertebrae amphicœlian; abdominal ribs. Limbs well developed. Clavicles slender, not dilated proximally; interclavicle minute. Skin of head free from skull; teguments soft, granular, and tubercular.

This family contains a single genus, the aberrant *Uroplates* of Madagascar, which combines with a Geckoid structure a peculiar sternal apparatus and the union of the nasal bones.

This family is allied to the Geckonidæ in its separate parietals, amphicœlous vertebrae, and reduced postorbital border and bar. The undilated clavicles, however, justify Boulenger's separation of it from that family, and the fusion of the nasal bones emphasize the distinction. It includes but one genus, which is characterized as follows:

Digits depressed, more or less webbed, with very small equal scales inferiorly, the extremity strongly dilated, with two diverging series of lamellæ inferiorly; all the digits clawed, the claw retractile in the anterior notch of the distal expansion. Body covered with small juxtaposed scales. Pupil vertical. No eyelids. Ear opening distinct. No preanal nor femoral pores *Uroplates* Gray.

This genus includes three species, which are confined to Madagascar.

THECOGLOSSA.

Thecoglossa COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 227; Bull. U. S. Nat. Mus., No. 32, 1887, p. 25.

Thecoglossa pleurodotes WAGLER, part, Nat. Syst. Amphib., 1830, p. 163.

Petrous bone developed anterior to anterior semicircular canal, not articulating with the edge of the parietal. Olfactory lobes under-arched by frontal bone. Clavicles proximally simple. Vertebrae procoelous. Interclavicle anchor-shaped. Tongue smooth; hemipenis not calyculate.

But one family enters this superfamily, which is characterized as follows:

Teeth attached by oblique ankylosis to jaws. Nasal bones coössified; supratemporal foramen not roofed by dermoössification. Premaxillary bones single.

VARANIDÆ.

This family exists only in the tropical parts of the Old World.

VARANIDÆ.

Lacertiens CUVIER, part, Règne Anim., II, 1817, p. 22.

Tupinambidæ GRAY, part, Ann. Phil. (2), X, 1825, p. 199.

Ameivoidea FITZINGER, part, Neue Classif. Rept., 1826, p. 24.

Varanidæ GRAY, Phil. Mag. (2), II, 1827, p. 54.

Thecoglossa pleurodotes WAGLER, part, Syst. Amph., 1830, p. 163.

Monitores WIEGMANN, Herp. Mex., 1834, p. 7.

Varaniens DUMÉRIL and BIBRON, part, *Erp. Gén.*, III, 1836, p. 437.

Monitoridæ GRAY, *Ann. Nat. Hist.*, I, 1838, p. 392; *Cat. Liz.*, 1845, pp. 3, 6.

Varanidæ COPE, *Proc. Acad. Nat. Sci., Phila.*, 1864, p. 227.

Varanidæ BOULENGER, *Ann. Mag. Nat. Hist.* (5), XIV, 1884, p. 120; *Cat. Liz. Brit. Mus.*, 2d ed., II, 1885, p. 303.

Characters of the skeleton in this family are the following:

Premaxillary single, in contact with maxillopalatines. Splenial bone well developed, Meckel's groove exposed; coronoid produced anteriorly and not posteriorly on external face of ramus; angular little developed on inner, much developed on outer side of ramus; dentary not produced posteriorly. Supratemporal fossa not roofed by ossification. Nasal bones coössified.

The visceral characters of *Varanus*, the only genus of the family, are unlike those of other genera of lizards. The heart and liver occupy a more posterior position than usual, the heart being much further posterior to the sternum than any other family, and adjacent to the liver. The lungs do not partake in this peculiarity, since they begin a considerable distance anterior to the heart and terminate opposite the proximal extremity of the liver, instead of lying on either side of that organ and coterminous with it, which is the position in other Sauria.

The trachea bifurcates well cephalad of the lungs, presenting much longer bronchi than any other type. The aorta roots in like manner make their posterior curvature anterior to the usual position. The liver is bilobate at both extremities, but the right lobe is much produced distally into a striplike process, as in most other Sauria. The gall-bladder is on the superior side of the liver within the posterior border, and is not visible from below. The alimentary canal is of moderate length, and the small intestine is well specialized from the stomach. There is no dilatation constricted off as a colon. Urinary bladder and corpora adiposa present. The latter do not project freely into the coelom, but lie between the peritoneum and the body walls.

The peritoneal folds have the following distribution: There are two gastrohepatic sheets, but the right is much shorter caudad than the left. There is no sheet connecting the left lobe of the liver with the body wall nor are there any connecting the distal border of the liver with either body wall. A sheet, however, connects the right border of the liver with the body wall. At the middle of the hepatic border this sheet is single, but at the cephalad and caudad extremities it is double, producing funnel-shaped sacs which open toward each other. Ventral mesentery single, and not extending beyond liver. A strong sheet of peritoneum connects the pericardium with the body wall on each side.

The great ease with which the peritoneum is separated from the body walls in *Varanus* has led authors to make some curious statements. Thus Günther says¹ that the corpora adiposa are inclosed in a

¹ The Anatomy of *Regenia ocellata*, *Proc. Zool. Soc. London*, February-March, 1861.

separate sac of the "peritoneum." They occupy the usual position outside of the peritoneum, and as they do not project freely into the body cavity, can not be said to occupy separate sacs. In lizards where they do project into the cœlom they do occupy pouches of peritoneum. Beddard¹ does not regard the ventral peritoneum as such, but thinks it to be distinct from it, calling it the "horizontal membrane." But it has all the relations of the ventral peritoneum of other lizards, and I believe it to be truly such. It is very loosely attached to the muscular walls by connective tissue.

In *Varanus salvator* the hemipenis is furnished with transverse flounces, which are longitudinally ribbed, except at the thin edge. The folds form a chevron directed distad. Apex smooth. In *V. arenarius* the apex is smooth, and on the base are longitudinal series of acute papillæ. In *V. griscus* the organ is entirely smooth in a specimen examined, but I do not know whether this condition is normal.

Boulenger remarks of the Varanidæ as follows:

Tongue smooth, very long and slender, bifid, retractile into a sheath at the base. Teeth large, dilated at the base, which is fixed to the inner side of the jaws. Palate toothless. Premaxillary single, narrowed, and much prolonged posteriorly; nasal bones coalesced and narrow; two frontals; a single parietal; a supraorbital bone; postorbital arch incomplete; a bony supratemporal arch; pterygoids and palatines widely separated; infraorbital fossa bounded by the pterygoid, palatine, and transverse bone, the maxillary being excluded.

The characters of the genus *Varanus* are as follows:

No dermal cranial ossifications; head covered with small polygonal scales. Eyelids well developed; ear-opening distinct. Limbs well developed; clavicle slender; interclavicle anchor-shaped. Dorsal scales roundish, juxtaposed, surrounded by rings of minute granules; ventral scales squarish, arranged in cross rows. No femoral or preanal pores. Tongue sheathed at base. Tail very long. A single genus confined to the Old World and Australia, and forming a perfectly isolated group..... *Varanus* Merrem.

In the mandible, Meckel's cartilage is not overroofed by the splenial bone. The dentary is not produced far posteriorly on the external side. The surangular bone is distinct. The symphysis mandible is not closely fitted, but is more or less free.

The genus *Varanus* includes, according to Boulenger, 28 species. None of these are of small size, and some of them reach a length of 6 feet.

HELODERMATOIDEA.

Helodermatoidea GILL, Smithsonian Report for 1885, 1886, p. 800.

Petrosal bone produced anterior to anterior semicircular canal. Olfactory lobes underarched by frontal bones. Supratemporal arch wanting. Clavicle proximally simple. Vertebrae proœelous. Tongue papillose.

This superfamily embraces but one family, the American Heloderma-

¹ Proc. Zool. Soc. Lond., 1888, p. 89.

tidæ. It is characterized as follows: Teeth anchylosed by oblique bases. Premaxillary and parietals single; frontal and nasals double. Interclavicle without transverse limbs. Hemipenis fionced. Liver with hepatolateral mesenteries. Apical portion of tongue protractile, smooth.

HELODERMATIDÆ.

Thecoglossæ pleurodontes WAGLER, part, Syst. Amph., 1830, p. 163.

Trachydermis WIEGMANN, Herpt. Mex., 1835, p. 23.

Varaniens DUMÉRIL and BIBRON, part, Erp. Gén., III, 1836, p. 437.

Helodermidæ GRAY, Proc. Zool. Soc., 1837, p. 132; Cat. Liz., 1845, pp. 3, 14.

Helodermidæ COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 228; 1866, p. 322.

Trachydermi glyphodonta BOCOURT, Miss. Sc. Mex. Rept., 1878, p. 296.

Helodermatidæ BOULENGER, Amer. Mag. Nat. Hist. (5), XIV, 1884, p. 120; Cat. Liz. Brit. Mus., 2d ed.; II, 1885, p. 300.

But one genus of this family is known, which is defined as follows:

Ear exposed. A gular fold. Digits 5-5, with a series of transverse lamellæ inferiorly. Upper surfaces uniformly tubercular; abdominal scales flat, juxtaposed. Labial shields present.....*Heloderma* Wiegmann.

Heloderma is characteristic of the Sonoran region of the nearctic fauna and adjacent parts of the neotropical.

HELODERMA Wiegmann.

Heloderma WIEGMANN, Isis, 1829, p. 624; Herp. Mex., 1834, p. 23.—WAGLER Syst.

Amph., 1830, p. 164.—DUMÉRIL and BIBRON, III, 1836, p. 499.—GRAY, Cat. Liz.

Brit. Mus., 1845, p. 14.—BOCOURT, Miss. Sc. Mex., Rept., 1878, p. 296.—BOU-

LENGER, Cat. Liz. Brit. Mus., II, 1885, p. 301.

Trachyderma WIEGMANN, Isis, 1829, p. 421; not of Latreille.

Teeth fang-like, with slightly swollen base, rather loosely attached to the inner edge of the jaws, grooved in front and behind; teeth on the pterygoid and palatine bones. A strong postorbital arch; pterygoids and palatines widely separated; infraorbital fossa bounded by the pterygoid, palatine, transverse bone, and maxillary. Head with bony tubercles. Eyelids well developed. Limbs well developed; clavicle slender; sternum divided longitudinally. Skin of upper surfaces tubercular, some of the larger tubercles ossifying in the adult, of lower surfaces forming transverse series of squarish plates. No femoral or preanal pores. Fore feet longer than hinder, with longer claws, the digits nearly equal, the outer shorter. The roof of the mouth with two separate fossæ for the posterior nares, and no median groove. Tongue thick, fleshy, depressed, arrow-shaped, and a little bifid at tip, attached along the median line, except for the terminal third. Tail not brittle.

Several descriptions of the skull and parts of the skeleton of *Heloderma* have been published, but all of them are seriously defective in not taking into account certain of the characters which are essential to a true understanding of the taxonomic position of the genus. For the following description I have before me two skeletons of the *H. suspectum* belonging to the U. S. National Museum.

Premaxillary with a large spine and a short alveolar portion; pos-

terior border abruptly emarginate to receive an anterior process of the vomers. The latter are very elongate, in contact for the anterior two-thirds of their length, but widely divaricating posteriorly; thin inferior surface convex in transverse sections; narial fossæ very large, the anterior extremity much narrowed. Palatine bones wider than long, the vomerine and palatine limbs subequal; palatine foramen very small, longitudinal; pterygoid narrowed anterior to basipterygoid processes, the anterior portion expanding gradually from behind; no pterygoid teeth; ectopterygoid flat; nasals narrow, encroached on each side of the middle by the elongate nostrils and with very slight contact with the prefrontals; frontals distinct from each other, wide; inferior plates oblique, in contact below, thus inclosing the olfactory lobes; parietal undivided, expanded laterally and without pineal foramen; supraoccipital scarcely in contact with parietal, which overhangs it; parietoquadrate arch very distinct, wide, its distal portion in front consisting of the large paroccipital; exoccipitals suturally distinct from both supra- and basi-occipital; facial plate of maxillary very large; prefrontals elongate, extending over the orbit to meet the postfrontals; lachrymal small, scarcely touching prefrontal, bounding the large lachrymal foramen anteriorly and in contact with jugal. The latter is an L-shaped bone, the subvertical limb reaching the postfrontal; postfrontal rather large, irregularly subtriangular; *no postorbital*; supratemporal a vertically triangular rudiment at the anterior base of the paroccipital; quadrate with one, an extero-posterior, conch; presphenoid cartilaginous; sphenoid and basioccipital distinct, not expanded laterally, the lateral descending tuberosities of the latter well defined; a large condylar foramen divided by an internal partition; occipital condyle distinctly tripartite; the pterygoid originates opposite the basipterygoids and touches both the petrosal and parietal, the latter sending down a slight lateral ridge. The subforaminal portion of the petrosal is not as long as the supraforaminal part and has a mere trace of a groove on its external side.

In the mandible the groove of Meckel's cartilage is open throughout. The coronoid bone is extended in both directions on the inner side, and anteriorly only on the external side. The dentary is short, not extending behind the anterior suture of the coronoid; splenial rather elevated, extending anterior to splenial foramen; surangular and articular distinct; angle narrowed, directed gently inward.

The hyoid apparatus is simple. No second ceratobranchials; the first simple osseous. Ceratohyal much curved, returning posteriorly on itself anteriorly to meet the extremity of the rather short hypohyal. Basihyal not wide.

There are only two ossified intercentra of the cervical vertebræ, and there are no hypapophyses. Atlas and two cervicals only without ribs. No zygosphenæ; prezygospophysial surface simple. The two sacral centra and diapophyses are not coossified. Caudal centra not seg-

mented, furnished with short diapophyses, chevron bones, and neural spines to near the end of the series; the last-named standing at the posterior border of the neural arch. Chevrons attached at posterior end of centrum, completely developed. Neural spines of cervical vertebrae moderate; those of lumbar region low.

Suprascapula short, wide; scapula short without proscapula; coracoid without emargination; epicoracoid large. Sternum with a small anterior fontanelle and a posterior emargination and an unossified line connecting the two; a groove diverges from the fontanelle on each side parallel to the coracoid border. Four sternal ribs on each side and no xiphoid rod. All the ribs with short, cartilaginous, free hæmapophyses.

Ilium slender, without *angulus cristæ*; acetabulum not emarginate. Pubis subtransverse; pectineal process small, external. Ischium rather wide, tuber an angle only.

The teeth have been frequently described, owing to their seeming adaptation to act as venom conduits to the wound they can inflict. They are pleurodont and attached by a very oblique base rather than by the side. The crown is conic and compressed acutely at the tip. The anterior face is marked by a deep groove which runs external to the middle line. It is formed by the rolling inward of the external layer of the crown over the anterior face of the tooth, at the base, the roll being less and less distinct upward.

The mesenteries of *Heloderma* are characteristic. There is a single hepatoventral, and the gastrohepatic has the usual position. The right hepatic goes to the right side of the stomach, becoming a right gastrohepatic, and does not extend to the dorsal peritoneum, a character in which it is unique in the Sauria. Posterior to the middle of the liver they unite on the middle line as in the Teiidae. The lungs are attached to the adjacent parts of the gastric peritoneum by separate sheets, the right and left gastropulmonary. Besides these there is a strong sheet on each side extending from the superior side of the liver near the border to the body wall, forming the right and left hepatolateral. The right hepatolateral does not extend along the right border of the liver beyond the cephalad half. The right gastrohepatic extends along the elongate right process of the liver to the genital fold of the peritoneum, and the apex of the liver sends a recurrent sheet backward, which forms with the former a funnel-shaped passage. This recurrent sheet might be regarded as a caudad hepatolateral. Dr. Shufeldt states¹ that *Heloderma* possesses the free ventral peritoneum found in *Varanus*; but this is not the case, as this structure is the usual one.

The peritoneum forms a transverse fold at the posterior part of the corpora adiposa, supporting the urinary bladder, and forming the cystic mesentery. It is but loosely attached to the corpora adiposa, which do not project freely from the body wall, and hence have no special peritoneal pouch. They are elongate and coarsely subdivided.

¹ Proc. Zool. Soc. Lond., 1890, pp. 193, 194.

The two aorta roots extend considerably anterior to the heart before turning posteriorly; the right root receives near its origin the common carotid, which soon thereafter divides into the right and left carotid. The right and left bronchi are distinct, but not elongate. The lungs are of subequal length; they are filled with coarse cells for about two-thirds their length.

The liver extends cephalad to the heart by its left lobe, the right falling a little short. The entire organ is large and elongate, the right lobe extending considerably beyond the left, but not terminating in a narrow strip, as in many *Pachyglossa*. The gall-bladder looks downward through a round foramen of the liver, between its two distal lobes, which are joined caudad to it. The alimentary canal includes an elongate stomach, followed by a rather elongate small intestine, which passes gradually into a moderately large rectum. The muscular walls of the stomach are not thick. The kidneys are rather wide, and about two-thirds of their length is within the pelvic cavity, the remaining third projecting anteriorly to it.

The hemipenis is undivided. Opposite to the sulcus spermaticus is a welt, which is smooth; between it and the sulcus are coarse plicate transverse folds, which extend to the apex of the organ.

There are two species of this genus, which differ as follows:

Pterygo-palatine teeth present; tail equal or longer than body; head and neck about half body; fore limbs to orbit; predominating color, black *H. horridum*.
No pterygo-palatine teeth; tail two-thirds body; head and neck one-third body; fore limb to orbit; predominating color, yellow *H. suspectum*.

The *Heloderma horridum*-Wiegmann has been brought from western Mexico, from Presidio on the north to as far south as the Isthmus of Tehuantepec. It has not been brought from eastern Mexico, so far as I am aware. The *H. suspectum* Cope is restricted to southern Arizona and New Mexico, so that a wide interval intervenes between the ranges of the two species.

HELODERMA SUSPECTUM Cope.

Heloderma suspectum COPE, Proc. Acad. Nat. Sci. Phila., 1869, p. 5.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 302.

Heloderma horridum BAIRD, U. S. Mex. Bound. Surv., II, Rept., 1859, pl. xxvi, not of Wiegmann.—COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 303.—BOCOURT, Miss. Sci. au. Mex., 1878, p. 297, pl. xxE, figs. 1-12; pl. xxG, figs. 1, 3, 6, 7, 8, 9, 10, 11.

Head about one-fifth the head and body; its width four-fifths the length. Tail about half the head and body. Hind legs contained three and one-half times in head and body; from the knee a little more than four times; this distance less than from elbow to end of claws. A shallow groove along median dorsal region of back and tail, with indication of another beneath.

General color purplish brown or black, varied with about eight rings of yellow, changing behind to orange. These are about two-thirds the

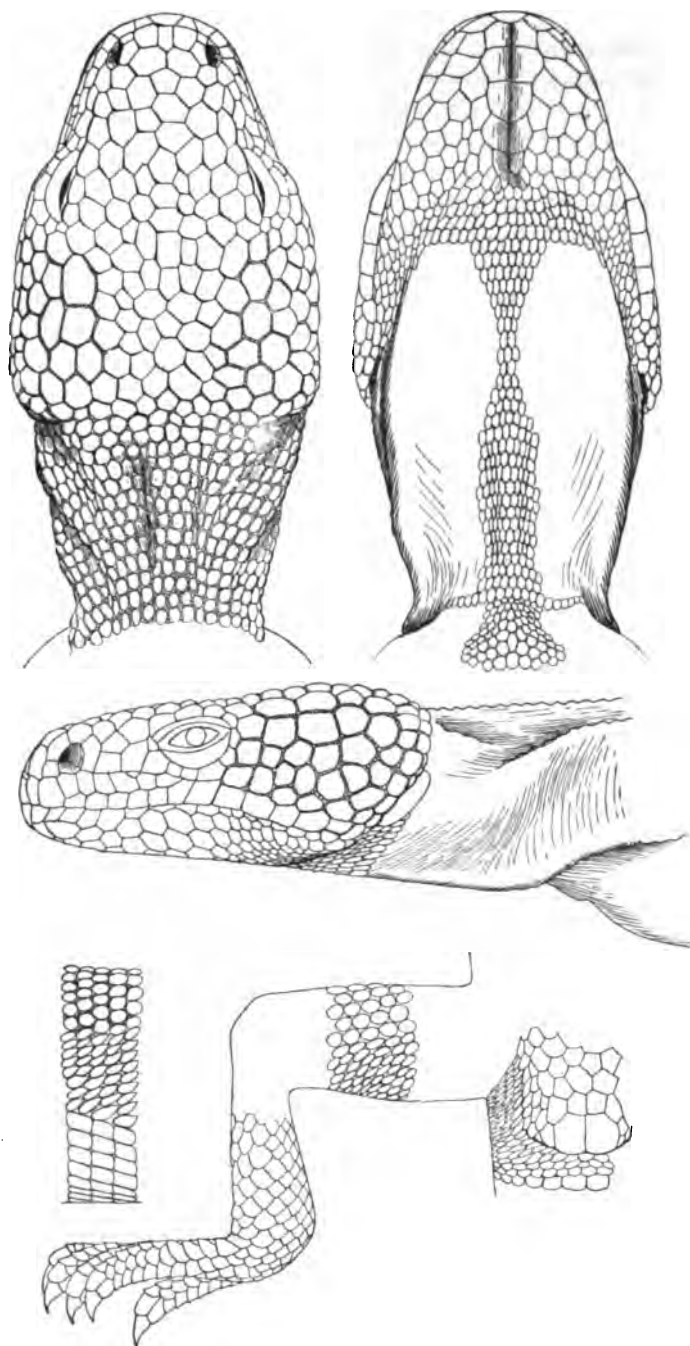


FIG. 87.
HELODERMA SUSPECTUM COPE.
 = 1.
 ARIZONA.
 Collection of E. D. Cope.

width of the brown rings, which are almost separated into two by an imperfect bar beneath and a series of four round spots on each side above, colored like the interspaces and involving four to six tubercles. One of these rings above the shoulders crosses the forearm. Another passes above the arms and across the middle of the thigh. The rest of the legs, with the entire head and throat, are black, except at the top of head behind the eyes, which is yellow. The tail, including the tip, shows four black rings and three yellow ones.

This regular arrangement of pattern on the body is appreciable only in the young. With increasing age the rings become broken up, and the pattern becomes an irregular, coarse reticulation of blackish, embracing the yellow tubercles, one or more looking like differently colored beads. The yellow predominates in some specimens, the black in others. The head is always black, with its yellow parietal patch.

Form clumsy and very heavy; head much broader than the neck, much depressed and flat above, the sides vertical and approaching each other anteriorly at an acute angle, but the muzzle broad and rounded.

The animal is covered everywhere except below with large tubercles, about the size of grains of No. 6 shot, each with a bony nucleus. These are subhemispherical, but generally somewhat calyptrate, exhibiting a blunted apex which is directed a little backward. Most of these exhibit a series of circular ridges and furrows parallel with the base of the tubercle. These vary in number, never extend to the apex of the tubercle, and are generally confined to the base.

These tubercles are arranged in regular series, which run obliquely backward from a shallow furrow along the back (from behind the shoulders to the tail) to the sides. They are, however, set in a frame of much smaller tubercular scales, generally in single series, sometimes more crowded. This framework constitutes a quite regularly hexagonal tessellation, with the rounded large tubercle set in the middle of each piece. Besides the obliquely longitudinal arrangement of the large tubercles, they may be traced in a more transverse one of fifteen or sixteen on each side.

On the belly and beneath the tail the tubercles change to quadrate and nearly square tessellated plates, close together and without intervening smaller ones. These also exhibit a tendency to arrangement in reference to a median line. They are placed in transverse series, corresponding in number with those of the sides and back, the change from one to the other not being very strongly marked. There are about twenty-five across the belly, and about sixty series from the end of the throat to the groin, with five or six more in the pubic region, where the plates are more irregular, the anal slit bordered by two median ones larger than the rest. The tail shows about fifty-five whorls of tubercles and plates corresponding with those on the body. It is very thick and blunt, subtetrahedral, and widening a little from the base to the middle.

The legs are covered with tubercles much as on the back, but smaller, and in places more depressed, especially on the under surface of the hind leg and the upper of the forearm. They are still smaller and more distant on the posterior face of the humerus.

The tubercles on the top of the head are larger than those on the back, and compacted, without the intervening small ones, giving somewhat of a hexagonal shape. They become larger to the tip of snout and are quite similar on the cheeks. The nostrils are terminal, lateral, large, and semicircular, the chord vertical and anterior, formed by two nearly square plates, one above the other. The rostral is about half as high as long, nearly quadrangular or depressed pentagonal. On each side of it is one labial of equal height, succeeded by twelve others, the first four or five of which have a second series above them. The mental plate is as wide as the rostral. There are about twelve labials on each side of this. There are four median pairs of large subquadrate plates behind the mental, and four or five smaller, more hexagonal series between these and the labial. The rest of the under surface of the head is covered with regular elongated ovoidal tubercles, half as large as those on the back, but without intervening smaller ones.

The ears are vertical or a little oblique, quite large, though not very conspicuous. The eyes are small, the eyelids short, very thick, and covered with tubercles, one series above and two below. Although the entire head is covered with tubercles, there may be traced a series of about six behind and below the eye, with a continuation of four more quadrate ones to the nostril.

The legs are short and stout, the hinder scarcely, if any, longer than the anterior. The feet are all five-toed, with conspicuous claws. The fore feet are decidedly larger and broader, with considerably longer claws than the hinder ones. All the digits exhibit inferiorly a series of transverse, imbricated, coarse lamellæ. The fingers are nearly of equal length, the claws of first and fifth reaching as far as bases of those of second, third, and fourth. The toes are more unequal; the third and fourth about equal, the second claw reaching the base of the third, the fifth that of second, the first that of fifth.

The teeth of *Heloderma* are acrodont, or on the summit of elevations of the bones bearing them. They are long, conical, acute, slightly recurved, and all have a conspicuous furrow on the anterior face from the base to tip, apparently formed by the folding together of a triangular plate. I can detect no evidence of any poison glands. The teeth are few in number, distant, eight or ten on each side of each jaw, and though long are so much embedded in the fleshy gums as to exhibit only the points. They are confined to the anterior part of the jaws, and do not come as far back as the posterior nares. The palate is deeply but broadly excavated, the pterygoid bones are prominent, and in one specimen bear a single conical tooth.

The tongue is thick and fleshy; arrow-shaped or oblong cordate; the base deeply emarginate with rounded lobes, the tip thin, flattened, and bifid for about one-fifth the whole length. Posteriorly it is covered by coarse papillæ or short filaments; on the terminal half these are much shorter, lower, and more compact, while the ends of the bifid tip are smooth. The tongue is attached firmly along its middle (though perhaps narrowly) for the basal two-thirds, the terminal portion being free, smooth beneath, and divided by a median furrow, the portion covering the bifid tip rather distinct and ovate.

The skin of the tail is very rough and continuous, so that it holds together the vertebræ very firmly and does not allow the tail to break. A specimen has the tail partly decomposed, and yet the tough skin keeps all the vertebræ together.

The description of *Heloderma suspectum*, as given above, differs in some important points from that of Wiegmann's of the *H. horridum*. A conspicuous difference of the external features is seen in the small tubercles encircling the large ones, said by Wiegmann to be wanting and forming the basis of subfamily distinction from the Varanidæ. These tubercles, though small and containing no bony center like the large ones, are yet very appreciable. The large tubercles are more widely separated in his figure than in nature, owing, doubtless, to the skin being stretched, which would at the same time eradicate the small basal intermediate tubercles. The tail is given as equal to the body instead of half the head and body, and is also more attenuated. It is said to have five yellow rings instead of four. The head is entirely black. These characters are confirmed by three specimens sent by Mr. F. Sumichrast from Tehuantepec, Mexico, all stuffed skins, and which served as the basis of comparison when I distinguished this species from the *H. horridum*.

I find the following characters to be constant: When specimens of the two species with identical body length are compared the tail of the *H. suspectum* is seen to be about two-thirds the length of that of the *H. horridum*, and the muzzle of the *H. suspectum* reaches only to the front of the orbit of the *H. horridum*. The forefoot reaches to the nostril in the *H. suspectum* and to the orbit in the *H. horridum*. The scales on the head of the *H. horridum* are larger than those on the *H. suspectum*, especially posterior to the orbit; but, as the head is longer in the former, the number counted between the orbit and the ear is equal in the two species. In counting across the head from one angle of the mouth to the other I find 21 scales in the *H. suspectum* and 17 in the *H. horridum*. In the latter I count 44 crossrows of abdominal scales; in the former 52. The ground color in the *H. horridum* is black, and yellow marks are sparse. In the *H. suspectum* the yellow is more conspicuous than the black on the head and on the belly, and is equally so on the upper surfaces of the body and tail. The dimensions of the two species are about the same.

Boulenger¹ further adds the following differences between the two:

In the *H. suspectum* the oral portion of the premaxillary is narrower, and its ascending internarial bar wider than in the *H. horridum*. Eight or nine premaxillary teeth are present in *H. horridum* and only six in *H. suspectum*. Dr. Shufeldt, however, represents eight teeth in the latter species, but his figure showing all the teeth as of the same size looks very diagrammatic. The postorbital arch is more slender in *H. suspectum*. Palatine and pterygoid teeth appear to be constantly absent in *H. suspectum*, whereas they are present in both skulls of *H. horridum* examined by me, as well as in those described by Troschel and by Kaup

I remark on these statements, that in two crania of *H. suspectum* before me there are no pterygoid or palatine teeth, except that in one there are two rudiments on the palatine of one side and one rudiment on the other. In both there are alveoli for eight premaxillary teeth, and in both only one of these is unoccupied by a tooth. In both the premaxillary spine is wide at the base, as described by Boulenger for the *H. suspectum*, but in both it is long, as described by him for the *H. horridum*.

Habits.—It has been shown that the bite of the *Heloderma suspectum* is, under favorable circumstances, poisonous. Experiments tried at or near Tucson, Arizona, by Dr. Irwin, United States Army, in 1862-63, did not demonstrate this fact, as fowls bitten by the *Heloderma* did not die. Dr. R. W. Shufeldt was bitten by a specimen at the Smithsonian Institution, Washington, and he describes his symptoms in a paper published in the American Naturalist.

The results were not serious nor different from such as result from any lacerated wound. Experiments made by Drs. S. Weir Mitchell and Edward F. Reichert, of the University of Pennsylvania, showed that the saliva injected into the body is speedily fatal to pigeons and fowls.

The history of observations as to the venomous characteristics of this species is thus given by Dr. R. W. Shufeldt:²

At the present writing the wide variance of opinion in these premises is truly remarkable, for some of our most distinguished investigators still disagree in the matter, and those, too, who have made the most exhaustive examinations of the saliva of this reptile.

As long ago as 1857, John Edward Gray, of the British Museum, in referring to *Neoturus*, said, "I know of no other instance of a batrachian having this structure of its teeth, nor do I know of any instance, except in the Mexican lizard called *Heloderma horridum*, in which all the teeth are uniformly furnished with a basal cavity and foramen, and this lizard is said to be noxious; but the fact has not been distinctly proved."

Prof. E. D. Cope, who first clearly characterized this reptile and gave it its present name of *Heloderma suspectum*, has stated that "though the lizards of this genus could not be proved to inflict a poisonous bite, yet the salivary glands of the lower jaw were emptied by an efferent duct which issued at the base of each tooth, and in such a way that the saliva would be conveyed into the wound by the deep groove of the crown."

Then several years passed before much else was published upon this special topic

¹Proc. Zool. Soc. Lond., 1891, p. 110.

²New York Medical Journal, May, 1891.

of the life history of the *Heloderma*, when Sumichrast, a well-known naturalist resident in Mexico, stated it as his opinion that it was the exception that small mammals died from the bite of this saurian.

Soon after there appeared an editorial in the American Naturalist (1882, p. 842) referring to the experiments of Dr. Irwin, of the Army, which went to prove that the bite of the *Heloderma* was comparatively harmless; but it added, further, that a specimen in the Zoological Garden of London had bitten a frog and a guinea pig, both of which had died in a few moments. Still, the editor of the Naturalist was of the opinion that "this might happen if this large lizard was not poisonous, and there is room for more careful experiments as to its venomous qualities."

In the same year no less distinguished an authority than Dr. Günther, of the British Museum, comes forward and states that there can be no doubt as to the poisonous nature of the bite of *Heloderma horridum*, and cites numerous cases to support his views; and Dr. Selater, the secretary of the Zoological Society of London, apparently entertained a similar opinion, as did also the eminent herpetologist, Mr. Boulenger, of the British Museum.

During the same year the present writer, who was at that time connected with the department of reptiles at the U. S. National Museum, was severely bitten by an infuriated adult specimen of *Heloderma suspectum*, and although much pain and grave symptoms at once supervened, the results passed entirely away in a few days with barely any treatment. I published a short account of it at the time. Again, before the year closed, Sir Joseph Fayrer brought forth some evidence, deduced from experiments, that went to show the poisonous nature of the bite of a *Heloderma*.

Early in 1883, however, the matter seemed to be definitely settled for good and all, through the results obtained by the very celebrated experiments of those two distinguished physicians of Philadelphia, Dr. S. Weir Mitchell and Dr. Edward T. Reichert. After a most carefully conducted series of experiments with the saliva taken from living *Helodermas*, these authorities were prepared to say that it possessed properties of an extremely venomous nature, killing pigeons and small mammals a few moments after they had received an injection of it hypodermically.

Five years now elapsed with hardly a printed word appearing anywhere upon the question of the poisonous or nonpoisonous qualities of the saliva of one of these suspected reptiles. Then there appeared an account of the somewhat remarkable series of experiments made with the saliva of living *Helodermas* by Dr. H. C. Yarrow at the U. S. National Museum, Dr. Yarrow at the time being honorary curator of the department of reptiles in that institution. This investigator's methods of procedure were rather different from those adopted by Mitchell and Reichert, but apparently they were conducted with equal care, and, strange to say, led to an entirely different result. Some eight or nine experiments upon chickens and rabbits went to prove that hypodermic injections of the saliva and bites of angry *Helodermas* were by no means fatal to those animals, and practically they always recovered from the effects of the same. After presenting the steps of his final trial, this author concludes his account with the following remarks: "This experiment would seem to show that a large amount of the *Heloderma* saliva can be inserted into the tissues without producing any harm, and it is still a mystery to the writer how Dr. Mitchell and Dr. Reichert obtained entirely different results. Were it not for the well-known accuracy and carefulness of Dr. Mitchell, it might be supposed possibly that the hypodermic syringe used in his experiments contained a certain amount of *Crotalus* or cobra venom, but under the circumstances such a hypothesis is entirely untenable." The following year Dr. Mitchell still adhered to his original opinion, and undoubtedly does at the present time.

Mr. Samuel Garman, of the Museum of Comparative Zoology of Harvard University, next made some very interesting experiments by allowing large and vigorous *Helodermas* to bite the shaved legs of kittens, and here again these feline victims refused to succumb to the effects of the wounds.

Very evidently the last word upon this subject has not yet been said, and opinions are very much divided, a host of supporters appearing upon either side.

In confinement, as in nature, the *Heloderma suspectum* is sluggish in its movements. It is not especially timid, and opens its mouth and ejects air in bursts from its lungs at the intruder. Some individuals will seize a stick presented to them and hold on tenaciously. Its breath is fetid, which adds to the forbidding character of the animal. A specimen sent me by Dr. J. G. Gibson from St. Thomas, Arizona, became rather tame, and showed a liking for having the top of its head scratched with a stick. It showed more than usual interest in passing events, raising itself on its fore feet and elevating its head as though listening. Like most of the individuals kept in confinement it ate readily of raw eggs, lapping them up with the protrusile smooth extremity of the tongue. They also drink water by inserting the nose into the fluid. In climbing up steep places it utilizes its robust tail as a support, and a very slight hold with the powerful claws of the fore feet is sufficient to enable it to raise itself.

It is not uncommon in the dry and desert regions of southern Arizona. I have heard of its occurrence in the adjacent regions of New Mexico, but did not meet with it myself on any of several visits I paid to that country. Dr. Stejneger reports that the Death Valley exploring expedition obtained a specimen from the Virgin River in southern Nevada. Dr. Merriam was told by the Mormons that the species occurs in the Lower Santa Clara Valley in southwestern Utah, but it is rare.

Heloderma suspectum Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2971	3	Sierra de la Union.....		Major Emory	Head. Alcoholic. do. do. do. do.
4271	1	San Pedro .....	.....	Hays	
	1	Mohave River .....	.....	Whipple	
8535	1	Arizona .....	.....	Captain Corlies, U. S. A.	
8187	3	do	— —, 1871	Expl. W. of 100th M.	
8454	1	Mount Trumbull, Arizona	Sept. 19, 1874	G. H. Sommer	
8225	1	Arizona .....	.....	Capt. Chas. Bendire, U. S. A.	
10403	1	Fort McDowell, Texas.....	.....	.....	
10686	1	Camp J. A. Rucker, Arizona.....	— —, 1882	Dr. E. T. Burr	
15043	1	Tempe, Arizona .....	.....	.....	
14789	1	Arizona		W. L. Carpenter	do. do. do. do. do. do. do. do. do. do.
17087	1	San Carlos, Arizona .....	.....	G. J. Westerdahl	
18011	1	Tempe, Arizona .....	.....	E. L. Stormont	
19620	1	do .....	.....	do	
20562	1	San Pedro River, Arizona .....	.....	Dr. E. A. Mearns	
20995	1	Niggerhead Mountain, Sonora, Mexico. ....	.....	do	
20996	1	San Bernardino, Sonora, Mexico. ....	.....	do	
20997-9	3	Guadalupe Canyon, Mexico. ....	.....	do	
21000	1	Near monument 88, Sonora, Mexico. ....	.....	do	

DIPLOGLOSSA.

Diploglossa COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 227; Bull. U. S. Nat. Mus., No. 32, 1887, p. 25.

Petrous bone produced anterior to anterior semicircular canal. Clavicle simple proximally. Interclavicle cruciform (with exceptions in degenerate forms). Premaxillary undivided. Mandibular elements distinct; dentary not produced far posteriorly. Tongue papillose, the apex smooth and generally retractile into papillose portion.

This superfamily occupies a position between the Pachyglossa and Leptoglossa, having the tongue and clavicle of the former, and the interclavicle and petrous bone of the latter. Its composition is somewhat heterogeneous, since the Zonuridæ differ in some respects from the other families.

The following characters of the visceral anatomy are common to all the families except the Zonuridæ:

Alimentary canal with a stomach and elongate rectum only differentiated. Liver very elongate, usually two-lobed posteriorly, the right lobe a little longer. Gall-bladder located at the apex of the fissure separating the lobes or proximad to it, *exposed inferiorly*, or only covered by thin tissue. Corpus adiposum not projecting freely into the body-cavity (except Zonuridæ).

Peculiar modifications are exhibited by the snake-like genera, which do not, however, invalidate the preceding definitions. In *Pseudopus*, *Ophisaurus*, *Dopasia*, and *Anguis*, together with *Celestus* and *Diploglossus* (*monotropis*) which are not snake-like, the left lung is shorter than the right. The liver is greatly elongated in the four genera first named above, and in *Ophisaurus* (*ventralis*) the left lobe is absent. In the other snake-like genera it is present, but shorter than the right. In *Pseudopus*, *Ophisaurus*, and *Anguis* the ventral mesentery extends to the rectum. It has a similar extent in *Dopasia*, but seems to be interrupted. In lacertiform Diploglossa the ventral mesentery is simple and terminates at the liver or a little beyond it.

Zonurus differs in several respects from other Diploglossa. The liver is trilobate posteriorly, but the gall-bladder has the inferior exposure normal to the superfamily. The corpora adiposa project freely into the body-cavity, which is not the case in other Diploglossa.

In *Xenosaurus grandis* and *Celestus stenurus* the kidneys are larger than in species of other genera examined.

As already remarked, the hemipenis in this superfamily is transversely laminate or flounced, and is never calyculate. The structures differ much in detail. Thus in some of the Anguidæ the organ possesses osseous spines, which is unusual in Sauria, although general in Ophidia. In the Xenosauridæ it is remarkably papillose. In none of the genera are the laminæ delicate and thin as in the Teiidæ, but they are thick and frequently wrinkled or pocketed.

Four families are referable to the Diploglossa, which are defined as follows. The position of the Pygopodidæ is somewhat uncertain:

I. Apex of tongue not retractile.

Cranial arches present; interclavicle cruciform; orbit bounded by frontal bone; corpus adiposum projecting freely into body-cavity ZONURIDÆ

Cranial arches absent; interclavicle rudimental are wanting; prefrontal and postfrontal united above orbit; articular, angular, and surangular bones not distinct..... PYGOPODIDÆ

II. Apex of tongue retractile. Corpus adiposum entirely adherent.

Cranial arches present; no inferior frontal arch; interclavicle cruciform; teeth pleurodont; osteodermal plates..... ANGUIDÆ

Cranial arches present; no inferior frontal arch; interclavicle cruciform; teeth pleurodont; no osteodermal plates..... XENOSAURIDÆ

The families of Section I are Old World, the Zonuridæ belonging to the Ethiopian zoological realm, and the Pygopodidæ to the Australian. The remaining families are New World, except that among Anguidæ three genera belong to the palæarctic realm.

ZONURIDÆ.

Cordyloidea FITZINGER, part, Neue Classif. Rept., 1826, p. 18.

Autarchoglossæ WAGLER, part, Syst. Amph., 1830, p. 152.

Chamæsaursi, *Ptychopleuri* WIEGMANN, part, Herp. Mex., 1834, pp. 11, 29.

Chalcidiens DUMÉRIL and BIBRON, part, Erp. Gén., V, 1839, p. 318.

Zonuridæ, *Chamæsauridæ* GRAY, part, Cat. Liz., 1845, pp. 4, 45, 61.

Zonuridæ COPE, part, Proc. Am. Assoc. Adv. Sci., XIX, 1871, p. 236.

Zonuridæ BOULENGER, Ann. Mag. Nat. Hist. (5), XIV, 1884, p. 119; Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 251.

Tongue short, villose, scarcely protractile, entire or very feebly nicked at the end. Dentition pleurodont; teeth numerous, small, with long cylindrical shafts, hollowed out at the base. Palate toothless. Postorbital and frontosquamosal arches bony; supratemporal fossa roofed over by dermo-ossification; præmaxillary, frontal, and parietal single; nasals distinct; palatines and pterygoids widely separated medially, both bordering the infraorbital fossa; head with dermal bony shields. Clavicle slender, not dilated proximally; interclavicle cruciform; sternum without fontanelle. No abdominal ribs. Head symmetrically shielded. Eyelids well developed. Scales on the body, if not granular, arranged in transverse series. Osteodermal plates present in one genus, but devoid of distinct tubules.

Like the preceding, this family has points of resemblance with the Iguanidæ and with the Anguidæ. From the former it is distinguished by the cranial dermal ossifications and the cruciform interclavicle; from the latter by the tongue, which, like that of the Iguanidæ, is not divisible into an anterior and a posterior part, the œlodont dentition, and the structure of the bony plates of the body when present. (Boulenger.)

Six genera are known, inhabiting South and tropical Africa and Madagascar.

SYNOPSIS OF THE GENERA.

I. Limbs well developed.

A. Back with osteodermal plates.

Dorsal scales large *Zonurus* Merrem.

AA. Back without osteodermal plates.

Dorsal lepidosis heterogeneous *Pseudocordylus* Smith.Dorsal lepidosis uniformly granular *Platysaurus* Smith.

II. Limbs rudimentary, body serpentiform; scales lanceolate, keeled.

Limbs present; digits 5-5 *Cricochalots* Wiegmann.Limbs present, undivided *Chamaesaura* Schneider.No fore limbs; hind limbs undivided *Mancus* Cope.

The mesenteries in the genus *Zonurus* are of the usual type. There are one hepatovenral, a gastrohepatic, a left gastropulmonary, and a right hepatic, which incloses the right lung.

The hemipenis I have only seen in the *Zonurus cordylus*. It is short and swollen so that the spiral structure is accentuated. There is a rigid welt opposite the sulcus, which leaves a triangular space at one side proximad which is finely calyculate. On the opposite side of the welt distad is a wide space with radiating laminae from a smooth center. The presence of calyculi noted is exceptional in the *Diploglossa*, and indicates approximation to the *Pachyglossa* as far as it goes.

The arches and limbs of the degenerate species *Mancus macrolepis*, from Natal, have the following characters: Scapular and pelvic arches both present. Anterior limbs, none; posterior limb, an externally undivided rudiment.

Scapular arch.—All the elements present. Sternum supporting three hæmal ribs on each side, deeply emarginate so as to be horseshoe-shaped, with a short posterior prolongation; each branch cartilaginous anteriorly. Suprascapula cartilaginous. Scapula and coracoid confluent, osseous; procoracoid cartilage. Interclavicle cruciform, with long posterior axis.

Pelvic arch.—All the elements present, but small and slender. Ilium attached to the distally confluent diapophyses of two vertebræ. Pubes slender, in contact anteriorly. Ischia directed anteriorly, not forming a symphysis, but separated by a median osseous element, which, following Baur, I call the hypogastroid bone. This is produced anteriorly as a cartilage, which joins the pubes, and posteriorly as a median simple cartilaginous rod.

Posterior limb.—This is about as long as the pubis and half the ilium. It consists of a femur, distinct but closely apposed tibia and fibula, about three-fifths the length of the femur, and a simple conical tarsal.

PYGOPODIDÆ.

Scoincoidiens CUVIER, part, Règne Anim., II, 1817, p. 52.

Gymnophthalmoides FITZINGER, part, Neue Classif. Rept., 1826, p. 26.

Autarchoglossa WAGLER, part, Syst. Amph., 1830, p. 152.

Gymnophthalmi WIEGMANN, part, Herp. Mex., 1834, p. 5.

Scoincoidiens DUMÉRIEUX and BIBRON, part, Erp. Gén., V, 1839, p. 511.

Pygopidae GRAY, Cat. Liz., 1845, pp. 4, 67.

Aprasiadae GRAY, Cat. Liz., 1845, pp. 4, 68.

Lialisidae GRAY, Cat. Liz., 1845, pp. 4, 69.

Pygopodidae BOULENGER, Ann. Mag. Nat. Hist. (5), XIV, 1884, p. 119; Cat. Liz. Brit. Mus., 2d ed., I, 1885, p. 239.

According to Boulenger—

The premaxillary is single, narrowed, and much produced posteriorly between the nasals, in the long-snouted *Lialis* quite as much as in the Varanidae; the nasals are distinct; the frontal is single; the præ- and postfrontals are in contact, separating the frontal from the orbit; the parietals remain distinct, except in *Lialis*; the jugal is rudimentary, there being no postorbital arch; a postfrontosquamosal arch is also absent; the pterygoids are widely separated and toothless. The mandible contains only four bones, the angular, supra-angular, and articular having coalesced. The dentition is pleurodont. The teeth are small, numerous, and closely set; in *Lialis* they are recurved posteriorly, very acute, and swollen at the base, thus resembling those of the Varanidae, whilst in the other genera they do not diverge from the normal pleurodont type, being obtusely pointed and with long cylindrical shafts. The skin of the head is quite free from the cranial ossification and there are no supra-orbital bones. The serpentiform body is destitute of functional limbs; the forelimb is entirely absent, while the hind pair is visible externally as a scaly flap, most developed in *Pygopus*, in which the bones of the limb may be felt more or less distinctly; when the skin is removed in *Pygopus* the foot with five ossified toes is seen most plainly, especially in the males; the ischium appears externally as a small spur on each side behind the anal cleft. The sternal apparatus exists in a rudimentary state. The tail is long and fragile. The eyes are rather small, with elliptico-vertical or subelliptical pupil, and not protected by movable lids. The ear is either exposed or concealed under the scales. The tongue is fleshy, papillose, elongate, more or less fully incised anteriorly, and extensible. The body is covered with roundish imbricate scales and the head is more or less regularly plated. Præanal pores are frequently present.

SYNOPSIS OF GENERA.

I. Parietal bones distinct; head with 51 large and symmetrical shields.

A. Præanal pores.

Scales keeled..... *Pygopus* Merrem.

Scales smooth..... *Cryptodelma* Fischer.

AA. No præanal pores.

Scales smooth; parietal plates large; two rows of enlarged ventral plates.

Delma Gray.

Scales bicarinate..... *Pletholax* Cope.

Scales smooth; subequal; no parietal plates; ear concealed.. *Aprasia* Gray.

II. Parietal bone single; head covered with small scales..... *Lialis* Gray.

The degradational features of *Pygopus lepidopus*, the type of the genus, are as follows: They have been already described in part by Heusinger,¹ Cuvier,² Müller,³ and Fürbringer.⁴ From Australia.

Scapular and pelvic arches present; no anterior, and rudimental posterior, limbs.

Scapular arch.—Elements present except interclavicle. Sternum a small longitudinally oval cartilage in contact with coracoid cartilages

¹ Zeitschr. für organ. Physik., III, Pt. 5, p. 489.

² Règne Animal, 1817, II, p. 56.

³ Tiedemann u. Treviranus, Zeitschr. f. Physiologie, IV, 1831, p. 227.

⁴ Die Knochen u. Muskeln der schlangenähnlichen Saurier, Leipzig, 1870.

only; supporting two hæmal ribs at its posterior extremity. Clavicles long, slender, extended well anteriorly, simple and in contact distally. Coracoid, precoracoid, and scapula, osseous, confluent. Coracoid cartilage not reaching precoracoid.

Pelvic arch.—Ilium elongate, proximal half horizontal, parallel with three vertebræ; distal portion decurved and confluent with pubis and ischium. Latter elements both rudimental, widely separated on the median line. Hypogastroid cartilage represented by a slender rod extending posteriorly on each side from the position of the acetabulum. Perhaps these cartilages represent the ischia, but they are possibly present with ischia in *Ophæodes*.

Posterior limb.—This consists of femur, tibia, and fibula, and four metatarsals, all inclosed in a common integument. It is about as long as the ilium.

My observations on this genus agree with those of Fürbringer

ANGUIDÆ.

Ophisauroidæ, Chalcidoidea, Anguinoidea FITZINGER, part, Nene Classif. Rept., 1826, pp. 20, 24.

Autarchoglossæ WAGLER, part, Syst. Amph., 1830, p. 152.

Ptychopleuri, Scinci WIEGMANN, part, Herp. Mex., 1834, pp. 29, 35.

Chalcidiens, Scincoidiens DUMÉRIL and BIBRON, part, Erp. Gén., V, 1839, p. 318.

Zonuridæ, Scincidæ GRAY, part, Cat. Liz., 1845, pp. 5, 45, 70.

Anguidæ, Gerrhonotidæ COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 228.

Anguidæ BOULENGER, Ann. Mag. Nat. Hist. (5), XIV, 1884, p. 119; Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 265.

Boulenger's description is as follows:

The tongue is composed of two distinct portions—a principal posterior, thick, covered with villiform papillæ; and a small anterior, thin, emarginate, covered with lepidoid imbricate papillæ, extensible and more or less retractile into a sheath formed by a transverse fold at the anterior extremity of the villose portion. This retractility of the distal part of the tongue appears to be constant, though more accentuated in some species than in others; but it should be borne in mind that when the tongue is fully extended, every trace of the transverse fold or sheath disappears, which accounts for the seeming exceptions presented by spirit specimens in that condition.

The dentition varies from the strictly pleurodont tubercular teeth of *Pseudopus apus* and some *Diploglossi*, through the conical teeth of the majority of species, to the curved fangs of *Anguis*. The dentition of the latter has no other equivalent but that of *Heloderma*, to which it bears considerable resemblance; and Leydig has even discovered the presence of a slight groove along the anterior surface of the teeth which appears to be homologous with the anterior groove of the poisonous lizard's fangs; the teeth of *Anguis* are likewise remarkable for the comparatively feeble attachment to the jaws, as in *Heloderma* and the snakes. The new teeth do not hollow out the base of the old ones, but originate between them. The palate is either toothless, or teeth may be developed on the pterygoids or even on the palatines and vomers (*Ophisaurus*).

The skull belongs to the normal Saurian type. The premaxillary is single; nasals distinct; frontal single in *Gerrhonotus*, double in the other genera; parietal single; palatines and pterygoids well separated along the medial line; infraorbital fossa bounded by the palatine, pterygoid, transverse bone, and maxillary. Dermal cranial ossifications are present, which roof over the supratemporal fossa. The limbs

may be more or less developed, or entirely absent externally, in which case, however, the rudiments of the pectoral and pelvic arches are always present. The clavicle is slender, and the interclavicle, in the species with well-developed limbs, cruciform. Abdominal ribs are absent.

The body is protected by bony plates underlying the scales, which are imbricate and subequal. These plates are provided with a system of fine tubules, as in the Scincidae, which differ from those of the latter family in being arranged irregularly or forming radiating or arborescent figures. The head shields present this peculiarity, that an occipital or zygous posterior shield is constantly present, a character which differentiates the Anguidæ from most of the Scincidae.

These lizards are terrestrial. *Anguis* is ovoviviparous. They are most abundantly represented in Central America (*Gerrhonotus*) and the West Indies (*Celestus*); a few species occur in North and South America; two in Europe and the borders of the Mediterranean, and one in the Himalayas and Burma.

This family I constructed from fragments of the old Zonuridæ and Scincidae, agreeing with Peters in referring the Old World representatives of the former to the Lacertidæ and those of the New to the neighborhood of *Heloderma*. From the Scincidae I have taken the New World Diploglossinæ, finding them possessed of the same peculiar characters which associate *Pseudopus* with *Gerrhonotus* and *Heloderma*. The families represented by these types do not possess the dilated maxillary laminæ of the Scincidae.

There are four subgroups among the genera of Anguidæ, namely: Ophisaurinæ, with the anterior limb of the mesosternum very short or wanting, the dorsal scales in crossrows and a lateral fold; genera *Dopasia*, *Pseudopus*, *Ophisaurus*, and *Opheodes*. Anguinæ, with shortened mesosternum and no lateral fold; *Opheodes* and *Anguis*. Diploglossinæ, without lateral fold, with elongate anterior limb of mesosternum and quincuncial scales, containing *Onida*, *Panolopus*, *Sauresia*, *Diploglossus*, *Microlepis*, and *Celestus*. (In *D. monotropis* Peters I have observed an apparent exception to the rule of the retractility of the end of the tongue in this tribe.) Finally, in the preceding groups there is a large foramen which connects the nasal meatus with the anterior part of the palate on each side in the premaxillary bone, which is wanting in the Gerrhonotinæ, and there are dermal shields on the parietal and occipital regions, which are represented by scales in the Gerrhonotinæ.

The hemipenis presents well-marked characters, which distinguish the genera and perhaps the subfamilies. In *Celestus* the extremity carries an osseous spicule of relatively large size. Distad of the flounces are more (*C. stenurus*) or less (*C. badius*) numerous longitudinal series of recurved osseous spines, which are longer near the sulcus spermaticus. In *C. stenurus* the flounces are apiculate at regular intervals. Organ undivided. In the Gerrhonotinæ the flounces are cupped and continue to the apex without spines; in *Barissia* and *Gerrhonotus* the organ is bifurcate; in *Elgaria* simple. In *Anguis* a welt on each side of the sulcus has tubercular cross ridges, and the remainder of the surface is marked with oblique folds with tubercular margins, forming a chevron which is directed distad. In *Pseudopus apus* the organ is not symmetrical. Opposite the sulcus is a low, broad, smooth welt, and on

each side the sulcus is margined by a thin welt or lip. This is coarsely plicate transversely, the plicæ extending to the welt. On the other side the transverse plicæ terminate at a band of fine longitudinal folds. In *Ophisaurus* the organ is undivided, and there is a welt with one edge and the proximal end free. It is covered with robust papillæ.

The genera are otherwise characterized as follows:

- I. A premaxillary foramen; no lateral fold; anterior limb of interclavicle short. Anguinæ.
 Rudimental posterior limbs *Ophæodes* Wagler.
 No rudiments of limbs *Anguis* Linnaeus.
- II. A premaxillary foramen; anterior limb of interclavicle short or wanting; a lateral fold of the integument. Ophisaurinæ.
 Rudiments of hind limbs only; meatus auditorius open.... *Pseudopus* Merrem.
 No limbs; meatus auditorius open; are interclavicle..... *Ophisaurus* Daudin.
 No limbs; meatus open; no interclavicle *Dopasia* Gray
 Rudimental limbs; meatus closed *Hyalosaurus* Günther.
- III. A premaxillary foramen; anterior limb of interclavicle generally well developed; no lateral fold. Diploglossinæ. (Limbs, four.)
 Feet pentadactyle; frontonasal plates distinct *Diploglossus* Wiegmann.
 Feet pentadactyle; frontonasal plates united into a single shield.. *Celestus* Gray
 Feet tetradactyle; one frontonasal..... *Sauresia* Gray
 Feet mono- or didactyle; one frontonasal..... *Panolopus* Cope.
- IV. No premaxillary foramen; anterior limb of interclavicle well developed; a lateral fold. Gerrhonotinæ.
 Interfrontonasal plate and frontonasal plates present... *Gerrhonotus* Wiegmann.
 Interfrontonasal present; frontonasals absent..... *Mesaspis* Cope.
 Interfrontonasal wanting; frontonasal plates present *Barisia* Gray

The geographical range of these genera is as follows:

Nearctic genera: *Ophisaurus*, *Gerrhonotus*.

Neotropical genera: *Ophæodes*, *Diploglossus*, *Celestus*, *Sauresia*, *Panolopus*, *Gerrhonotus*, *Mesaspis*, *Barisia*.

Palearctic genera: *Anguis*, *Pseudopus*.

Paleotropical genera: *Dopasia*.

Ethiopian and Australian genera: None.

I have examined the osteology of three exotic serpentiform genera, with the following result:

Anguis fragilis Linnaeus. Described by Heusinger,¹ Müller,² and imperfectly figured by Duméril and Bibron.³ It is well described and figured by Fürbringer.⁴ Europe.

Scapular and pelvic arches present; no limbs.

Scapular arch.—Interclavicle wanting; other elements present. Sternum roughly transverse diamond shaped, with the posterior border slightly convex. No costal connections. Ossification slight. Clavicles osseous, slender, directed forward medially, and not quite meeting on the median line. Scapula cartilaginous, coracoid osseous. A large coracoid cartilage, which slightly overlaps that of the other side ante-

¹Zeitschr. für organ. Physik., III, Pt. 5, pl. III, fig. 9.

²Tiedemann u. Treviranus, Zeitschr. f. Physiologie, IV, 1831.

³Erp. Gén., pl. VII, figs. 6, 10.

⁴Die Knochen u. Muskeln der schlangenähnlichen Saurier, Leipzig, 1870, pp. 14, 42, pl. I, fig. 9; pl. III, figs. 37, 38.

riorly, and is recurved at the anterior apex, to continue as the slender procoracoid cartilage.

Pelvic arch.—Three elements fused into one, as in the preceding genera, the distal elements forming a suboval plate; the ilium a short, curved rod, articulating proximally with a single robust diapophysis of a single vertebra. The whole structure is entirely lateral.

Observations.—Duméril and Bibron commit an error in their figure of the *Anguis fragilis*, in representing the pelvic elements as meeting on the middle line below, which is far from being the case. Fürbringer's figures are much more accurate.

Ophodes striatus Spix. Partially described by Müller,¹ imperfectly figured by Duméril and Bibron,² and well described and figured by Fürbringer.³ South America.

Scapular and pelvic arches present; no anterior limbs; posterior limbs present, rudimental.

Scapular arch.—All the elements present; clavicles well developed; distally simple. Interclavicle approximated to them, anchor-shaped, with very short posterior axis, which is widely separated from the sternum. Scapula, coracoid, and precoracoid, osseous, confluent; no coracoid cartilage. Precoracoid cartilage a slender rod, wedged between the interclavicle and the clavicle. Sternum subtriangular, with shallow anterior notch, supporting two hæmal ribs on each side.

Pelvic arch.—All the elements present, the pubis and ischium not in contact on the median line. Ilium articulating below its middle with the confluent diapophyses of two vertebrae. Pubis about as long as ilium, the distal half rodlike, and separated from its fellow by a space equal to its length. It terminates in a short cartilaginous rod, which is directed forward (? epigastroid cartilage). The ischium is transverse in position, and somewhat expanded distally, sending forward a membranous sheet to the pubis. Posteriorly it gives origin to a cartilaginous rod (hypogastroid) which speedily joins its fellow, and continues with it as a double median cartilage, terminating acutely. This cartilage resembles that already described in *Pygopus*, where, however, the two do not meet on the middle line.

Posterior limb.—This is a little longer than the ilium. It consists of femur, tibia and fibula about two-thirds as long, and tarsal and metatarsal elements, all closely adherent. The former are three in number and the latter two.

Observations.—In the figure by Duméril and Bibron of the scapular arch the precoracoid is omitted. The pelvis has been drawn from a dried specimen where the inferior arches have been divided and the lateral elements widely separated. The cartilages are not represented.

Dopasia gracilis Gray. From the Himalayas. Not previously studied. Scapular and pelvic arches present; no limbs.

¹ Zeitschr. f. Physiol., IV, 1831.

² Knoeken und Muskeln, pp. 11, 38.

³ Erpétologie Générale, Atlas, 1854, pl. VII, figs. 3-7.

Scapular arch.—Interclavicle wanting; clavicles present, osseous, meeting medially. Scapula cartilaginous; coracoid osseous. A large coracoid cartilage, which is continued proximally into the short and narrow precoracoid cartilage. Sternum without rib connections, of a transversely crescentic form, the convexity anterior, with some ossific deposit at the middle, on each side of the median line.

Pelvic arch.—The three elements fused into a single piece, of which the ilium forms a slender proximal part and the distal elements an oval plate, concave anteriorly and convex posteriorly; the whole entirely lateral in position, and having a general resemblance to the corresponding parts of *Ophisaurus*. Ilium short, its proximal extremity in contact with a very robust diapophysis of a single vertebra.

Observations.—The absence of the interclavicle justifies the retention of the genus *Dopasia* Gray as distinct from *Ophisaurus*. I have examined two skeletons of the *D. gracilis* and a half dozen of those of *O. ventralis*.

The characters of *Ophisaurus* are pointed out under that genus.

The viscera do not display any exceptional features, except as to the serpentiform genera referred to under the head of Diploglossa. The mesenteries are of the typical character, modified in *Ophisaurus* by the reduction of the left lung. The hepatovenral sheet is very near the left margin of the liver in *Pseudopus apus*, and the gastrohepatic and right hepatic are near together when slack.

OPHISAURUS Daudin.

Ophisaurus DAUDIN, Hist. Rept., VII, p. 346.—FITZINGER, N. Classif. Rept., 1826, p. 20.—WAGLER, Syst. Amph., 1830, p. 159.—WIEGMANN, Herp. Mex., 1834, p. 11.—DUMÉRIL and BIBRON, V, 1839, p. 421.—GRAY, Cat. Liz., 1845, p. 55.—BOULENGER, part, Cat. Liz. Brit. Mus., 1885, II, p. 279.

Hyalinus MERREM, Tent. Amphib., 1820, p. 79.

Body serpentiform, without external trace of limbs. A deep lateral groove from near head to anus. Scales hard, bony, in transverse series. An external ear, and scaly eyelids. Nostrils lateral, in a single plate. Tongue arrow-shaped, notched, and flat anteriorly, where it is free for about half its length. Palatine teeth. Tail much longer than body.

The genus *Ophisaurus* is similar to the Gerrhonoti in essential characters, but differs in the absence of limbs. The fold on each side is occupied by a soft skin which connects the dorsal and the ventral sheets of plates, the latter folding or lapping over the upper and concealing its lower edge. The plates on the body are quadrate and arranged in transverse series, the dorsal and ventral not corresponding in size and separated, as stated. On the tail the scales are in whorls, or bony rings, between which fractures occur very readily.

In this genus the skeleton resembles in many respects *Gerrhonotus*, while presenting some important differences, which will be indicated below. Premaxillary with elongate spine above, and concave palatal margin interrupted by a short posteriorly produced angle on the middle

line. The nasals are elongate and distinct from each other. The frontal is narrow and double; its inferior lateral plates converge below, but are separated by a wide fissure. The parietal is rather elongate, and the pineal foramen is near its middle. The parieto-quadrate arches are horizontal, but well elevated above the occipital. The supraoccipital is so loosely articulated as not to touch the parietal, and it is separated by suture from the exoccipitals. The prefrontal is rather small and is not protuberant; it is not produced on the superior orbital border. The facial plate of the maxillary is large, and forms most of the lateral boundary of the nasals. The lachrymal is small and is barely reached by the narrow jugals. Postfrontal distinct, triradiate, the inferior limb shortest, the superior in contact equally, one with the frontal and one with the parietal. Infratemporal splint-like, very little in contact with jugal, separated by a narrow slit from parietal, and entering for a considerable distance into the parieto-quadrate arch. Paroccipital exhibiting a narrow wedge from behind. Quadrate a deeply excavated external conch and a trace of the internal. Vomers elongate, each traversed by an elevated median keel; posterior ends separated by a deep notch, continuous with the rather narrow space which separates the palatines and the anterior part of the pterygoid. Narial fissure narrow, a portion cut off anteriorly as a small foramen by a lateral expansion of the vomer. A rather large foramen between maxillary and premaxillary. Maxillary process of palatine a little longer than vomerine process. Palatine foramen large; palatine bones rather narrow. Pterygoids rather narrow, the contraction of the external border gradual. Ectopterygoid not decurved proximally. Sphenoid and basioccipital coossified; lateral processes of latter compressed, concave posteriorly. Occipital condyle small, its tripartite composition faintly indicated. Epipterygoid arising just in front of basipterygoid, not reaching parietal, but resting on supraforaminal part of petrosal, which is longer than the infraforaminal process. The latter possesses a shallow canal, which is presented externally behind.

In the mandible Meckel's cartilage is concealed, except distally on the inferior face of the ramus. The external face of the coronoid is produced anteriorly only, and the dentary is produced posteriorly very little behind the line of its anterior angle. Angular mostly external; splenial elongate; articular and surangular fused on the external face of the ramus. The angle is horizontal, short, and rounded.

The hyoid apparatus is characterized by the absence of second ceratobranchials and free epibranchials. The first ceratobranchials are rather short. The hypobranchials are rather long, and the ceratohyals project a little beyond their extremity. The middle of the length of the ceratohyals is membranous.

Scapular arch.—All the elements present, but more or less rudimental. Clavicles well developed, simple, and nearly meeting distally. Scapula cartilaginous, coracoid osseous, with a large cartilage which is pro-

duced anteriorly and is continuous with the small cartilaginous procoracoid. Interclavicle posterior to the coracoid cartilages and overlapping the anterior border of the sternum; its anterior axis very short, the posterior still shorter. Sternum transverse, subcrescentic, cartilaginous, not supporting any ribs.

In the cervical vertebræ the odontoid process is short, and is coossified. There are six intercentra; the sixth low, the rest rather prominent. All the cervicals have ribs, except the axis and third. No zygosphene; prezygapophysial faces not reflected on neural arch. Diapophyses very short; neural spines moderately elevated, especially on cervical and caudal regions. On the latter they are rather narrow and stand at the posterior border of the neural arch, looking backward. At the anterior border is a second short spinous neural spine, which looks forward. A gap, which is roofed by membrane, separates the anterior from the posterior borders of the neural arches. The centrum is not segmented, but breaks very readily immediately behind the cup and in front of the diapophyses. Chevron bones coossified with the middles of the centra, and not intercentral. The centra, except at the ball-and-socket articulations, are quite as attenuated as the neural arches, whence their great fragility.

Pelvic arch.—Ilium short, proximally in contact with a single vertebra, distally confluent with the rudimental pubis and ischium, which form together an oval plate, entirely lateral in position.

Posterior limb.—This is an undivided short rod of cartilage, which is loosely articulated to the posterior concavity of the pelvic element, thus marking the position of the acetabulum. All the teeth simple and with acuminate apex.

Besides the peculiarities resulting from the reduction of the extremities, this genus differs from *Gerrhonotus* as follows: The presence of maxillopremaxillary foramen; the isolation of the anterior part of the posterior narial fissure as a foramen; the coossification of the sphenoid and basioccipital bones. The nonsegmentation of the caudal centra; the presence of two neural spines on them, and the very peculiar chevron bones.

But one species of this genus is known. Boulenger unites the genera *Pseudopus*, *Hyalosaurus*, and *Dopasia* with it; but *Pseudopus* and *Hyalosaurus* have posterior limbs, and I have shown that *Dopasia* has no interclavicle.¹ *Hyalosaurus* also has the auricular meatus closed.

OPHISAURUS VENTRALIS Linnæus.

Ophisaurus ventralis DAUDIN, Hist. Rept., VII, p. 352, pl. LXXXVIII.—OPPEL, Ordn. Rept., 1811, p. 45.—CUVIER, Règne Anim., II, 1817, p. 59.—FITZINGER, Neue Class. Rept., 1826, p. 50.—HARLAN, Jour. Acad. Nat. Sci. Phila., 1827, V, p. 346.—WAGLER, Syst. Amph., 1830, p. 159.—GRAY, Syn. Rept. Griff. Cuv., IX, 1831, p. 65.—WIEGMANN, Herp. Mex., 1834, p. 11.—DUMÉRIL and BIBRON, Herp. Gén., V, 1839, p. 423.—DUVERNOY, Règne Anim. Rept., pl. XXIV, fig. 1.—

¹ Journal of Morphology, VII, 1892, p. 229.

- HOLBROOK, Am. Herp., 2d ed., II, 1842, p. 139, pl. xx.—DUMÉRIL, Cat. Coll. Rept., 1851, p. 144.—YARROW, Bull. U. S. Nat. Mus., No. 24, p. 46.—BOULENGER, Cat. Liz. Brit. Mus., 1885, II, p. 281.
- Anguis ventralis* LINNÆUS, Syst. Nat., 12th ed., II, 1766, p. 391.—DONNDORF, Zool. Beytr., III, p. 267.—SHAW, Gen. Zool., III, pl. 2, p. 581.—LATREILLE, Hist. Nat. Rept., IV, p. 223.
- Chamasauro ventralis* SCHNEIDER, Hist. Amph., II, 1804, p. 215.
- Hyalinus ventralis* MERREM, Tent. Syst. Amph., 1820, p. 79.
- Anguis fragilis* GMELIN, Syst. Nat., 1798, p. 1112.
- Ophisaurus punctatus* CUVIER, Règne Anim., 2d ed., II, 1829, p. 70.
- Ophisaurus striatulus* CUVIER, Règne Anim., 2d ed., II, 1829, p. 70.
- Ophisaurus lineatus* GRAY, Cat. Slender-tongue Saurians, Ann. Mag., I, 1838, p. 391.
- Ophisaurus ventralis* HALLOWELL, Proc. Acad. Nat. Sci. Phila., VIII, 1856, p. 239; 1856, p. 307.

There is a large and broad oblong frontal plate, and behind it a pentagonal interparietal, bordered by an elongate parietal plate on each side. The interfrontonasal is half as long as the frontal. There are two

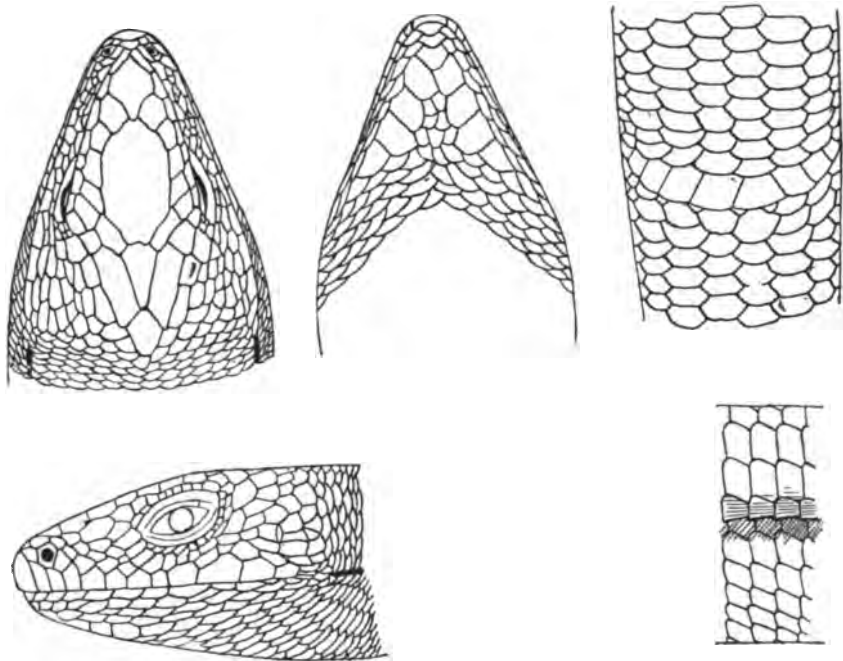


Fig. 88.

OPHISAURUS VENTRALIS VENTRALIS LINNÆUS.

× $\frac{1}{4}$.

Cat. No. 14584, U.S.N.M.

frontoparietals which are in contact with the fourth supraocular plate. There are two series of plates, supraorbitals and superciliaries, along the edge of the head, above the eye. The eyelids are distinct, the lower well covered with scales. There are two pairs of internasals and a

series of three more plates (one azygous) between them and the rostral. The nostril perforates a single small nasal plate. The space between this and the eye is occupied by two rows of five plates, with two other rows in a line above these posteriorly. Labials either bordering orbit, or more frequently separated by one or two rows of scales. Ten upper labials. Ears a short longitudinal closed slit or foramen of varying size in line between the mouth and lateral groove.

There are sixteen longitudinal series of plates in the dorsal sheet, the outer on each side the narrower, and ten in the ventral, the outer narrower; 126 in series from head to tail. The central six rows on the back have a distinct though blunt carination, almost inappreciable on the next rows; the rest of the lateral and all the ventral perfectly smooth. Tail very long. Seven or eight preanal scales, a little larger than the abdominal.

The color in most specimens from the Atlantic States is a very dark, greenish olive above; posterior border (in the corners) of each scale, with two bluish or greenish white rounded spots. The central line of each series, especially where traversed by the ridge, is darker than the ground color and not spotted. The under parts are plain greenish white. The top and sides of the head are spotted like the back.

A few Atlantic specimens have the central eight or nine rows of scales brownish or olivaceous yellow, the checkers or tessellation of the first variety showing through either irregularly or as transverse bands of black spotted with white. In many specimens three stripes above the fold on each side may be indistinctly outlined, while in others the three stripes may be perfectly distinct. These may be reduced to two or even one stripe, and occasionally traces of a fourth may be present. With these may or may not be associated a median dorsal stripe.

There are considerable variations in the squamation of this species. The most usual is that which concerns the contact of the interfrontonasal with the frontal. This contact is rarely wide, is frequently narrow, and less frequently does not exist, the prefrontals being in contact on the middle line. I exhibit this and the presence of two interfrontonasals in the following table:

I. One interfrontonasal.

- A. Interfrontonasal broadly in contact with frontal; Cat. No. 15537 (a), half-grown; Wichita River, Texas, E. D. Cope, adult.
- B. Contact narrow; Cat. Nos. 8944, 14584, 9358 (young), adult; (2 adults); Cat. Nos. 14142 (2 spec.); 5322, 15537 (b) adult; 12783, 13809, 4985, 9360.
- C. No contact between frontal and interfrontonasal; Cat. Nos. 3201, 20811, 9358 (young), 15537 (c) adult; 5731 half-grown; 5130, 16949, 10584.

II. Two interfrontonasals, anterior and posterior.

- Anterior interfrontonasal fused with right posterior internasal; Cat. No. 10584.
- Anterior interfrontonasal distinct, Cat. No. 21359.

The degree of the carination of the scales varies considerably, but it is generally more conspicuous in the young than in the adult. Usually a

row of scales separates the labials from the eye, and sometimes there are two rows. In the type of the var. *sulcatus* one labial enters the eye border, and in Cat. No. 21359 two labials enter it.

The color varieties may be presented in the following form:

I. Lateral scales of the body with spots.

- A. Dorsal scales spotted like laterals; Cat. Nos. 9350, 9358, and 20811.
- B. Lateral spots larger; dorsal spots forming a series on each row of scales; Cat. Nos. 4168, 5135, 5138, 5130, 5137, 9260, 9687, 12754, 12783, 13685, 14142, 16949; Mobile, Alabama, E. D. Cope; Cat. Nos. 4985, 9359.
- C. Spots on three lateral rows; a median dorsal stripe, connected with lateral spots by cross-bands; Cat. No. 5322.
- D. Three rows of lateral spots; no dorsal stripe, but large, brown, pale edged lateral dorsal spots; Cat. No. 14724. The spots are connected so as to form complete dorsal cross-bands in a specimen from Gotha, Orange County, Florida.
- E. No dorsal stripes or spots; Cat. Nos. 6419, 13809.

II. Lateral spots confluent into stripes.

- F. Three lateral stripes, one dorsal stripe, and lateral dorsal spots. Nos. 1535, 1536, 1537, 18024.
- G. Four lateral and one dorsal stripe; Cat. Nos. 3201, 5038.
- H. Three lateral stripes and no dorsal; Cat. No. 11400. Two from Orange County, Florida, in the Milwaukee museum.
- I. Three lateral and one dorsal stripe; Cat. Nos. 3193, 5129, 5131, 5089, 6078, 8978, 9357, 12048, 13383, 14076, 14515, 6073, 9360; Volusia, Florida, E. D. Cope; Wichita River, Texas, E. D. Cope; Dallas, Texas, E. D. Cope.
- J. One lateral stripe and one dorsal; Cat. No. 10584.
- K. One lateral stripe and no dorsal; Cat. No. 21359.

Besides the stripes mentioned under II, there is sometimes a feeble one on the superior row of abdominal scales. Many specimens also have vertical pale bars with a dark posterior border on the side of the body from the ear for a varying but not long distance posteriorly. Such are Cat. Nos. 8978, 3201, 5129, 9357, 6073, 5089, 6419, 5135, 5138, 5130, 9260, 12754, 12783, 13685.

It now remains to be ascertained what indications these variations in squamation and coloration present of specific or subspecific value. In the first place, it is to be observed that the greater number of individuals are grouped into two color types, which are marked in the above list by the letters B and I, or the checkered and the striped patterns, respectively. Do any other characters accord with these conspicuous color varieties? I quoted on a former occasion the manuscript remark of Professor Baird that the western variety of this species has but 14 rows of scales, as distinguished from the eastern type with 16 rows, and that he called the former by the subspecific name of *attenuatus*.¹ I might have added that Professor Baird in his manuscript regarded the striped form as predominatingly western and the checkered type as eastern. Dr. Boulenger² has adopted this form as a distinct spe-

¹ Bulletin U. S. National Museum, No. 17, 1880, p. 18.

² Cat. Liz. Brit. Mus., 2d ed., II, p. 282.

cies, giving as a further definition that the ear opening is not larger than the nostril, while in the *O. ventralis* it is much larger.

An examination of the localities from which the color varieties above mentioned were derived shows that no well-defined specimens of the checkered variety have been sent from west of the Mississippi River, and that all from that region are striped. It shows, also, that the striped coloration occurs also east of the Mississippi in Illinois, North Carolina, South Carolina, and that it is abundant in Florida. It also shows that the striped form is not characterized by a smaller number of scales than the checkered form, nor do the trans-Mississippians have even generally 14 rows of scales. Thus, I find in Cat. No. 9360, from Kansas, 16 rows; Cat. No. 4985, Arkansas, 16 rows; Cat. No. 3201, southwestern Texas, 16 rows; Wichita, Texas, E. D. Cope, 14 rows; Dallas, Texas, E. D. Cope, 16 rows. The size of the auricular meatus is very variable. I have seen it as small as the nostril in only one specimen, and that is Cat. No. 10584, from Clearwater, Florida, of the striped

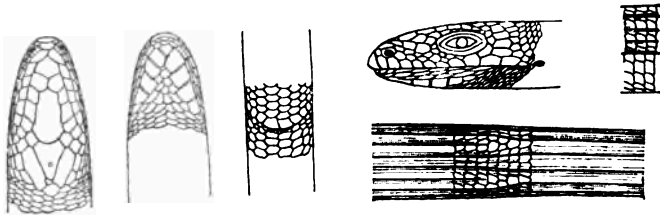


Fig. 89.

OPHISAURUS VENTRALIS LINNÆUS, YOUNG, TYPE OF *O. v. SULCATUS* COPE.
× 2.

Dallas, Texas,
Collection of E. D. Cope.

variety, and with 16 rows of scales. In some specimens it is nearly as long as the eye slit; in many others it is only half as long, etc.

I do not find the subspecies *attenuatus* Baird, or species, according to Boulenger, to be well founded. The subspecies *sulcatus* Cope, from Dallas, Texas, stands on no better foundation. The interfrontonasal is broadly in contact with the frontal, but this character occurs in a good many others, both checkered and striped, and is variable in specimens from the same locality (Cat. No. 15537). The second row of superciliary scales is represented by a half row in many specimens, and the one labial plate in the orbit is matched by Cat. No. 10584 from Clearwater, Florida. The carination of the scales is greater than usual, but the specimen is young and would have become, with age, as smooth as some of those before me.

The only specimen which diverges widely enough from the type to require mention is Cat. No. 21359, which is, however, approached by Cat. No. 14724.

I give a more detailed description of an individual of the striped type.

Body slender, contained two and one-third times in the tail; dorsal scales in fourteen longitudinal series; ventral in ten; and one hundred and twenty from head to anus. The carination of the dorsal scales is confined chiefly to the two median rows, although it is obsoletely visible on ten rows on each side of these. There is a conspicuous broad, but shallow groove along the back between these ten median carinæ. The head is very narrow, as high as broad.

The ground color is a light olive green, or greenish gray above, with a median and five lateral (on each side) nearly equal stripes of dark brown (or sides brown with four narrow white lines). The median occupies the space between the dorsal carinæ. Then comes an olive stripe of $1\frac{1}{2}$ rows, and then a brown stripe. For the rest of the lateral series there is a narrow, well-defined stripe of whitish in the central fifth; the space between these lines is brown. These markings are equally distinct on the tail, which has the stripes continued a little below the level of those on the sides, though continuous with those above the lateral groove. Near the head the dusky lateral stripes are divided transversely by whitish lines, the sides of the head checkered likewise. The under parts are greenish white.

The predominance of the fourteen rows of scales in the lineated Western glass snake, in distinction from the sixteen of the mere checkered eastern form, appears to be well marked, at least in large specimens. This is the case with Cat. No. 3193, from St. Louis, and a small one from Knoxville, Tennessee, differing only in having the clay-colored stripe, on each side the dorsal brown one, $2\frac{2}{3}$ instead of $1\frac{1}{2}$ scales wide. The latter was associated with a large one of the Atlantic type, with sixteen series of scales.

I did not observe this species in southwestern Texas, but obtained it from near Dallas. The specimens are of the Western variety, with only fourteen rows of dorsal scuta, or the subspecies *attenuatus* of Baird. A specimen from the same locality is similar in the characters named, but is remarkable for the strong carination of its superior scales. The carinæ are elevated on the ten median rows, so as to leave sulci between them. On the posterior part of the body the keels extend to the lateral rows, and on the tail even to the inferior surface. There are only ten superior labial scuta, and no postparietals. The infracanthal row extends over the eye, giving three rows between the latter and the frontal plate. I am not sure that these characters are constant, so I note this form under the varietal name of *sulcatus*. It is described from a half-grown animal.

The osteology of this species has been described by Müller,¹ Duméril and Bibron,² Cope³ (scapular arch in part), Fürbringer,⁴ and Shufeldt.⁵

Observations.—Müller¹ erroneously states that the sternum is wanting in this genus. The figure of the scapular arch given by Duméril

¹Zeitschr. f. Physiologie, IV, p. 227.

²Erp. Gén. Atlas, VII, figs. 5-9.

³Proc. Acad. Nat. Sci. Phila., 1864, p. 228.

⁴Knochen und Muskeln, pp. 14, 43, pls. I, fig. 8; III, fig. 36.

⁵Proc. U. S. Nat. Mus., IV, 1882, p. 397.

and Bibron is very defective in proportions. The posterior limb rudiment is not shown in the pelvic arch. This is figured by Shufeldt,¹ but he omits the interclavicle from the scapular arch. The pelvic elements and limb are well figured by Müller.² Fürbringer's description is good, but he overlooks the rudimental femur.

This "glass snake" is a rapacious feeder, living principally on the numerous Arthropoda which abound in the regions it inhabits. I took from the stomach of a specimen from Florida three ground spiders (! *Lycosa* sp.), a grasshopper, a cricket, a cockroach, a coleopterous and a lepidopterous larva, and a small snail. Its large intestine was packed with the fragments of coleoptera. It feeds readily in confinement, taking insects from the hand. If the insect is not promptly given up to it when seized, it will pull and struggle to secure it, as a dog will try to get a stick away from the hand of his master.

Ophisaurus ventralis Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4169	2	Knoxville, Tennessee.....	.....	Mitchell	Alcoholic.
4168	2	Indian River, Florida.....	.....	G. Wurdemann	do.
4170	1	.....	.....	Charleston College	do.
5137	1	Liberty County, Georgia.....	.....	Dr. W. L. Jones	do.
5138	1	Fort Morgan, Georgia.....	.....	G. Wurdemann	do.
5038	2	Georgia.....	.....	Dr. W. L. Jones	do.
9290	1	Wilmington, North Carolina.....	.....	.....	do.
6419	1	Newbern, North Carolina.....	.....	Capt. Wm. Holden	do.
5089	1	Calcasieu Pass, Louisiana.....	.....	G. Wurdemann	do.
9359	1	St. Johns River, Florida.....	.....	G. Brown Goode	do.
5135	1	Micanopy, Florida.....	.....	Dr. J. H. Bean	do.
8978	1	Florida.....	.....	.....	do.
9358	5	Pensacola, Florida.....	.....	.....	do.
5322	1	Mississippi.....	.....	Dr. B. F. Shumard	do.
4985	1	Arkansas.....	.....	.....	do.
5131	2	St. Louis, Missouri.....	.....	Dr. Geo. Engelmann	do.
5130	3	Charleston, South Carolina.....	.....	.....	do.
6078	1	Jalapa, Mexico.....	.....	.....	do.
5129	1	Between Arkansas River and Cimmaron River, New Mexico.....	.....	J. Fairie	do.
6073	1	Fort Scott, Arkansas.....	.....	Lieut. Enstis, U. S. A.	do.
9360	1	Kansas.....	.....	.....	do.
9357	1	.....	.....	.....	do.
9687	2	Arlington, Florida.....	May —, 1878	G. Brown Goode	do.
10584	1	Clearwater, Florida.....	July 11, 1879	S. T. Walker	do.
10714	1	Baraboo, Wisconsin.....	Oct. —, 1880	J. W. Wood	do.
11400	4	Fort Macon, North Carolina.....	— —, 1871	Dr. H. C. Yarrow	do.
12048	3	Mount Carmel, Illinois.....	Nov. —, 1881	L. M. Turner	do.
3201	1	Indianola to Neufes, Texas.....	.....	Capt. Pope	do.
3193	1	St. Louis, Missouri.....	.....	Dr. Geo. Engelmann	do.
12754	.....	Hawkinsville, Georgia.....	.....	J. B. McDuffie	do.
12783	1	Gainesville, Florida.....	.....	Jas. Bell	do.
13383	.....	Statesville, North Carolina.....	.....	J. A. D. Stephenson	do.
13685	.....	.....	.....	.....	do.
14076	1	Nebraska.....	.....	E. M. Shaw	do.
14515	1	Gainesville, Texas.....	.....	G. H. Ragsdale	do.
15535-7	8	Cook County, Texas.....	.....	do.	do.
10949	1	Umatilla, Florida.....	.....	C. L. Hopkins	do.
18024	.....	Greenville, South Carolina.....	.....	I. C. Fitzgerald	do.
14721	1	Rockwood, Tennessee.....	.....	Dr. J. A. Sewell	do.
9350	.....	.....	.....	.....	do.
20811	1	Micanopy, Florida.....	.....	Dr. W. C. Johnson	do.
13809	1	Blackville, South Carolina.....	.....	Dr. S. B. Lartigue	do.
13685	3	Georgiana, Florida.....	.....	Wm. Wittefield	do.
14142	2	Pilottown, Florida.....	.....	C. C. Nutting	do.

¹ Proc. U. S. Nat. Mus., IV, 1882, figs. 4, 5.

² Zeitschr. f. Physiologie, IV, pl. XIX, fig. 3.

OPHISAURUS VENTRALIS COMPRESSUS Cope.

This subspecies is founded on a single individual, Cat. No. 21359, from the coast of South Carolina. Were it not for the existence of a few specimens in a few respects intermediate between this form and the ordinary one, there could be no doubt of its full specific distinctness. Its characters are so peculiar that the least that can be accorded it is the rank of subspecies.

In the first place, the typical and only specimen has two interfrontonasal plates, one anterior to the other. This character is partly developed in only one other specimen, Cat. No. 10584, from Florida. Two labial plates border the orbit below. These are separated by one or two rows from the orbit in all the specimens except in the type of the var. *sulcatus* from Dallas, Texas, where one labial enters the orbit. A marked peculiarity is the compression of the head, body, and tail. The body is higher than wide, and the dorsal surface is narrow roof-shaped. The tail is more prominent on the middle line below than on the dorsal line, although the latter has not the flat character of other individuals. In fact this compression is absolutely unique in the genus, the typical variety being flat-backed throughout the length. Another peculiarity of

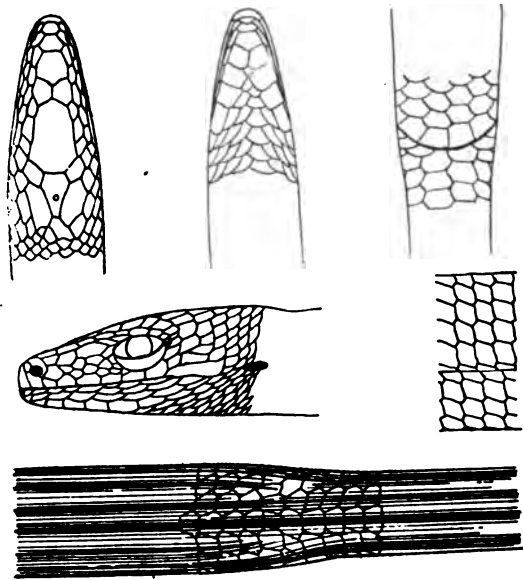


Fig. 90.

OPHISAURUS VENTRALIS COMPRESSUS COPE.

× $\frac{1}{2}$.

South Carolina.

Cat. No. 21359, U.S.N.M.

this specimen is the narrowness of the caudal scales, which are longer than wide, conspicuously so beyond the basal region. They are as wide as long, or even wider in the ordinary variety. The scales of the upper surfaces are in fourteen rows, of which only twelve are visible above the lateral fold. They are angulate roof-shaped, and are not keeled. There are only two rows of scales between the canthal row and the superior labials; in the ordinary form there are three. The prefrontals are broadly in mutual contact, as in a few other specimens, as Cat. No. 10584. The auricular fissure is about two-thirds the length of the eye fissure.

Measurements.—Total length, 668 mm.; head and body, 185 mm.; to angle of mouth, 18 mm.

The coloration is also peculiar, as already pointed out in the color table, this specimen being the only example of group K. The ground color of the anterior half of the body above the lateral fold with the head above the mouth is black; each scale, except some of those of the vertebral line, with one or more white centers. No vertical bands anteriorly; cephalic plates with white spots on thin borders. From the middle of the length of the body the black rapidly fades to brown, and the light spots disappear, while the edges of the scales are paler than their centers. About the middle third of the length of the body a black stripe appears, which covers the adjacent halves of the third and fourth rows of scales above the lateral fold, and extends thence with sharply defined borders to near the end of the tail. Below this band the color is uniform straw colored. Belly, throat, and chin the same.

The only specimen which resembles this one in color is Cat. No. 10584, from Florida, already mentioned, which has one lateral stripe. But it has also a median dorsal stripe, and the anterior half of the body and head are straw colored, as in the striped forms generally.

It is only the existence of Cat. No. 10584 that has restrained me from regarding the form *compressus* as a distinct species. And that specimen has the normal form of body and tail and of scales. It is possible that that specimen is a hybrid between the two subspecies *compressus* and *ventralis*.

Ophisaurus ventralis compressus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.
21359	1	South Island, Georgetown County, South Carolina.	E. P. Alexander.

CELESTUS Gray.

Celestus GRAY, Ann. Mag. Nat. Hist., II, 1837, p. 288; Cat. Liz. Brit. Mus., 1st ed., 1845, p. 117.—COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 123.

Siderolamprus COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 368.

No lateral tegumentary fold. Digits 5-5. Prefrontal and interfrontonasal plates fused.

This genus is regarded as not distinct from *Diploglossus* by some authors. In the latter the interfrontonasal and the two prefrontals are not united, and the character is, in my estimation, amply sufficient to separate it from *Celestus*. The latter is related to it as *Mesaspis* is to *Gerrohonotus*, and both these genera exhibit the first stage of the fusion of cephalic plates which terminates in the simple condition seen in *Anniella* and other genera.

The greater number of species of this genus is West Indian, and no species has been found in continental South America. Three species occur in Central America, one of them, *C. enneagrammus* Cope, on the southern borders of the Mexican Plateau, and thus coming within the scope of this work; and two, *C. bilobatus* O'Shaughnessy, and *C. cyanochloris* Cope,¹ in the high mountains of Costa Rica. This genus is one of the few which occur in both the West Indian and Central American regions. The genus *Diploglossus* occurs in tropical South America and in southern Central America.

The species of *Celestus* differ as follows:

I. Prefrontonasal plate.

A. Scales in 32-38 rows.

Keels of the scales 11, all equal, on posterior regions; anterior scales smooth, together in 36 rows; nasal plate extending to rostral; two loreals, both higher than long; ear minute, head and limbs very short, latter .75 former and .2 from axilla to groin; a blackish lateral band above, cross-lined before, spotted behind *C. pleii* Duméril and Bibron.

Keels of the scales 15, all equal; one postnasal, two frenals, both on labials; ear meatus small. Serpentineform, fore limb five-sixths head. Brown, with dark lateral band above *C. sagrae* Cocteau.

Keels of scales equal, 10 to 16, smooth on front of body; postnasals; two or three loreals; limbs well developed; dorsal scales with a yellow or blue center, forming lines which become obsolete in the old; side blackish *C. enneagrammus* Cope.

Scales in 36 rows, each with a central keel, which are very prominent on the tail; limbs weak, not meeting when oppressed; gray, with brown cross bands, which vanish on the sides *C. rugosus* Cope.

Scales in 33 rows, each with a dozen striæ and no median keel except on the tail, where they are strong; head scales striate, parietal and interparietal plates grooved; two pairs of loreals, each pair vertical; limbs strong; golden above, blue below *C. cyanochloris* Cope.

Scales in 37 rows, striated, but not keeled; head smooth; two loreals in horizontal line; sides with vertical brown patches. *C. bilobatus* O'Shaughnessy.

AA. Scales in from 40 to 56 longitudinal rows.

Scales 41-42 rows; keels 14; none larger; head narrow, sharp, muzzle longer than interorbital width; front plane; parietal separated from supraorbitals by two plates, loreal longer than high; gray, sides black, cross-banded; loreal higher than long *C. phorinus* Cope.

Scales 41-42 rows; keels 15, a median stronger; front convex; distance between orbits in front equal length muzzle; both loreals higher than long; one plate between parietal and supraorbitals; brown, a deep brown dorso-lateral band, and numerous longitudinal series of brown spots on the back *C. weinlandii* Cope.

Scales 41-42 rows; keels 25, none larger; head flat, acute, muzzle longer than interorbital width; many close, short bay stripes; loreal higher than long *C. badius* Cope.

Scales 41-42 rows; keels 25 to 35, one median much stronger; head shorter, obtuse, muzzle equal width between eyes; unicolor, with vertical lateral bars; two loreals, longer than high *C. stenurus* Cope.

¹ Proc. Acad. Nat. Sci. Phila., 1894, p. 200.

Scales 40-42 rows; keels 19, equal, scales plane; head elongate, narrow, muzzle longer than interocular width; brown, with 14 cross-bars on back..... *C. striatus* Gray.

Scales 46-50 rows; keels 34-38, the median stronger on dorsal region; form stout, fore limb one-third longer than head; tail much compressed; yellow or light brown, with about 15 brown cross bands... *C. occiduus* Shaw.

CELESTUS ENNEAGRAMMUS Cope.

Celestus enneagrammus COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 43.

Siderolamprus enneagrammus COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 368.

Diploglossus steindachneri COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 179.—BOCOURT, Miss. Sci. Mex. Rept., 1879, p. 383, pl. xxii, fig. 3, 3a, 3b.—GÜNTHER, Biol. C. Am. Rept., p. 34, pl. xxii, fig. A.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 293.

Celestus steindachnerii COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 123.

Diploglossus chalybæus COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 321.

Celestus chalybæus COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 321; Proc. Amer. Phil. Soc., XXII, 1885, p. 170.

Dorsal scales striated, not keeled. Rostral not quite so wide as the genial. Interfrontonasal large, irregularly pentagonal. Frontal longer than wide. Frontoparietals present. Nasal scute in contact with the rostral. Two postnasals superposed. Two or three loreals, the anterior often obliquely divided. A preocular. A subocular. Maxillary teeth with trilobate crowns. Trunk encircled with thirty-two to thirty-eight longitudinal series of scales, averaging thirty-six at the middle of the body. This species, like *Diploglossus bilobatus*, has the limbs well developed. It differs from that species in many particulars, especially in the shape of the cephalic plates.

Length of head from the end of the muzzle to the posterior border of the occipital plate equals about twelve dorsal scales, and is one-seventh of the distance between the chin and the cloaca. The second pair of supranasals (or prefrontonasals) are large and directed obliquely outward. The interfrontonasal is wider than it is long and articulates with the posterior concave border of the frontal. Frontal relatively long, narrower in front than behind. Five supraoculars, of which the second is wide in front and is in contact along that side with the interfrontonasal. The nasal, somewhat lengthened, is pierced posteriorly. Postnasals small, quadrilateral, and superposed. Of the three loreals, the middle one, when present, is the largest, and is pushed upward on the muzzle, extending above the canthus rostralis and rarely reaching the labials. Postloreal square, followed by a small median preocular. Finally, the subocular represents a very long rectangle. The supralabials, ten on each side, of which the seventh and eighth, not so deep as the others, support the subocular scute; the ninth is small and pentagonal; the tenth, still smaller but similar in outline, is succeeded by scutella similar to those on the cheek, which extend to the ear. Eight pairs of inferior labials. Rostral not quite so large as the genial. The

postgenial precedes three pairs of submaxillary plates, first pair of which are in contact along their internal sides.

The trunk is depressed, of medium length, covered with scales, which form thirty-four longitudinal series; the median dorsal series is composed of seventy-seven scutella, counting from the nape of the neck to the posterior level of the thighs. Scales on the under surface of the body smooth, but those on the back and sides are striated, having sixteen striae. Preanals are polygonal, not exceeding in size the ones which precede them. Scales of the normal region of the tail similar to those on the body; those on reproduced portions are distinctly keeled, forming by contact long prominent lines. Limbs relatively well developed; length of arm to the end of the middle finger more than one-third longer than the head. Toes of unequal length, the fifth of each foot being the longest.

Measurements.—Total length, 204 mm.; length of body from chin to anus, 112 mm.; length of tail, 92 mm.; length of head from the end of the muzzle to the posterior border of the occipital, 16 mm.; length of head from the end of the muzzle to the anterior border of the ear, 17 mm.; length of head to the level of the temples, 13 mm.; length of arm to the extremity of the middle finger, 23 mm.; length of leg to the extremity of the longest toe, 30 mm.

General tint olive yellow; three wide, longitudinal, brown bands extend along the back and sides, the middle one, beginning at the muzzle to the anterior part of the tail, is distinguished from the two lateral by narrow lines of golden yellow, or, in young specimens, blue; its width comprises nine series of scales, each of which has the central longitudinal line. The lateral bands are thickly strewn on the neck and flanks with small yellow circular spots rimmed with dark violet, the effect being that of a black and yellow trellis. The dorsal scales have their borders brown. The cheeks and lower surfaces of the body are bright yellow, except the throat, which is of a pale tint of the same color.

Six specimens of this species are before me, all from the Orizaban district of the Toltecan subregion, except one from Costa Rica. (See chapter on geographical distribution.) All have two preloreal, one above the other, except one. In one of the former the supraloreal extends down to the superior labial plates between the pre- and postloreal on one side only, an evident anomaly. In the specimen with but one preloreal I proposed the species *C. chalybaeus*. This specimen has apparently fewer longitudinal rows of scales than the others, but I find that the apparent number of scales depends on the locality in which they are counted. Thus the type of *D. chalybaeus* has thirty-four rows on the posterior part of the body and forty on the anterior part. Other specimens display the same character. This explains the discrepancies in the figures given by authors. This species was first described from a young example from Jalapa in the museum of the Philadelphia Academy. Specimens in the museums of London and Paris are from the plateau of Guatemala.

Celestus enneagrammus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
6342	1	Orizaba, Mexico.....	F. Sumichrast	Alcoholic.
	1	do.....	do.....	do.
	1	Tehuantepec, Mexico.....	do.....	do.

GERRHONOTUS Wiegmann.

Gerrhonotus WIEGMANN, Isis von Oken, 1828, p. 379; Herpetol. Mex., 1834, p. 29.—WAGLER, Nat. Syst. Amphib., 1830, p. 158.—DUMÉRIEUX and BIBRON, V, 1839, p. 394.—GRAY, Cat. Brit. Mus., 1st ed., 1845, p. 53.—COPE, Proc. Am. Phil. Soc., 1877, p. 96.—BOCOURT, Miss. Sci. Mex. Rept., 1878, p. 317.—BOULENGER, Cat. Brit. Mus., 2d ed. II, 1885, p. 266.

Pterogasterus PRALLE and GREEN, Journ. Acad. Nat. Sci. Phila., 1830, p. 234.—COPE, Proc. Am. Phil. Soc., 1877, p. 96.

Abronia GRAY, Ann. Mag. Nat. Hist., I, 1838, p. 389; Cat. Liz. Brit. Mus., p. 53.

Elgaria GRAY, Ann. Mag. Nat. Hist., I, 1838, p. 390; Cat. Liz. Brit. Mus., p. 54.

Scales of body in compact dorsal and ventral sheets, separated by a lateral interval of soft skin, and arranged in transverse series; those of the tail in bony rings or whorls. Throat without fold; external ears distinct; head above with rather regular plates. Limbs weak, short; anterior scarcely smaller than posterior, all with five digits terminated by short claws nearly concealed by a sheath of two scales. Nostrils lateral; no femoral pores.

Osteology.—A skeleton of the *G. multicarinatus* from the U. S. National Museum furnishes the material for the osteology of this genus.

The premaxillary has a well-developed spine and a truncate palatal border. Its alveolar border is short, and it forms but a small part of the inferior narial border. Nasal bones not short in front, rather narrowed by the maxillary and prefrontals on each side. Frontal narrow, single, partly inclosing olfactory lobes of the brain below, but the incurved lateral walls not touching. Parietal with small pineal foramen far behind coronal suture. Supraoccipital loosely articulated, and separated by suture from exoccipitals. Prefrontal not tuberiferous, produced posterior to middle of supraorbital border. Postfrontal crescentic, equally united with frontal and parietal. Postorbital splint-shaped, with very slight contact with the jugal, and long contact with the supratemporal. Jugal slender, reaching anteriorly the small lachrymal. Paroccipital narrowly exposed posteriorly, well produced upward on the distinct parietoquadrate arch. Quadrate with one deeply excavated conch, which is external. Vomers in close apposition in front, separated by a fissure posteriorly; the anterior portion excavated medially. Palatines descending from the plane of the vomers; the vomerine and maxillary processes about equal; main plate rather narrow. Palatine foramen large. Pterygoid contracting gradually into posterior slender portion; basipterygoid well developed. Presphenoid

wanting. Sphenoid and basioccipital separated by suture; descending tuberosities of the latter strong, compressed. Epipterygoid originating below opposite basipterygoid; above resting on anterior process of petrosal, and touching parietal just behind an obtuse descending angle of the decurved border of the same. Subforaminal portion of petrosal shorter than supraforaminal portion, inclosing a very narrow down-looking groove. Basioccipital and exoccipitals coossified; condyle small, simple.

Meckel's canal closed except distally, where it is open on the *under side* of the ramus. Coronoid developed anteriorly on external face of ramus, the dentary not reaching behind its anterior border. Splenial elongate, partly external; angular mostly external; surangular confluent with articular. Angle horizontal, incurved, with rounded border and concave superior surface.

Hyoid apparatus displays no second and rather short first ceratobranchials. Hypohyal rather long, the ceratohyal extending a little beyond its extremity, and widened at the posterior third. A free epibranchial, which has a bifurcate anterior extremity at that of the ceratohyal, and extends posteriorly but little behind the ceratobranchial.

Five cervical intercentra, and two cervicals besides atlas without ribs. The odontoid is coossified with the axis. Ribs extend to sacrum. Sacral diapophyses distinct from each other. Dorsal vertebræ without zygosphen, prezygapophyseal facets not continued on neural arch. Caudal diapophyses present; centra of middle region segmented through them; chevron bones intercentral. Neural spines low, higher on caudal region.

Suprascapula much larger than scapula; no proscapula. One large coracoid notch. Sternum without fontanelle, with three ribs and two attached to xiphoid rod.

Ilium without prominent *angulus cristæ*; acetabulum entire; pubes uniting at an acute angle; pectineal angle medium. Ischia with prominent tuber.

The detailed common characters of this genus will be found more fully among the specific description. The chief peculiarity is in the fold or strip of soft skin on each side, usually covered by the overlapping of the lower sheet on the upper. The dorsal scales are arranged in transverse series on each side, which pass a little obliquely backward on the back, so as to meet at an obtuse angle and not always evenly. The scales of the tail are in thick bony rings, easily separating, so that it is very rare to see a specimen which has not lost its tail and had it reproduced. In this case the indications of length afforded by the stump are very uncertain, and have given rise to grave errors in framing specific characters. It is probable that in none is it less than one and one-half or one and three-fourth times the head and body.

In the North American species there are always twelve longitudinal rows of ventral scales, and fourteen to sixteen dorsal; the latter usually

carinated. The transverse series on each side vary from thirty-nine to fifty-two. The head plates are quite symmetrical; their general character will be found detailed under *G. multicarinatus*. The variations are in the size of the large median frontal and of the outer nasals; the number of the postnasals, whether two, three, or four; and the outer row of supraorbitals, whether three or two.

Young individuals are much more brilliantly colored than adults and have a more distinct color pattern of alternating light and dark cross-bars. On young individuals were proposed the species *G. caeruleus* and *G. webbiai*. The colors fade out with maturity in most of the species, becoming shades of olive or brown with lateral bars, or if brilliant colors are retained as in *G. gramineus* and *G. auritus*, the crossbars disappear.

There is considerable irregularity in the scales of the head in some of the species, which renders it necessary to analyze closely their homologies. Between the prefrontals and the internasals on each side of the median or interfrontonasal plate there may be one, two, or three plates. When there is one, it generally meets its mate of the opposite side in front of the interfrontonasal. This plate is the prefrontonasal. Sometimes, as *G. auritus* or *G. liocephalus*, there may be another pair of prefrontonasals, which may or may not meet in front of the interfrontonasal. In addition to these there may be another, generally smaller, plate, which lies between the interfrontonasal and loreal on each side, which I call the lateral prefrontonasal. This never meets its mate of the other side, but is sometimes fused on one or the other side with the prefrontonasal. On the side of the muzzle there may be one or two scales between the nasal and internasal, the supranasals. Posterior to the nasal there may be one or two plates in contact with it, one above the other, the postnasals. Immediately in front of the eyes there are two plates, one above and one below, the preoculars, which may rarely be fused. Between these and the postnasals, or nasals when postnasals are absent, is one or two plates, the anterior and posterior loreals. When there is but one plate between the nasal and the postloreal, it is sometimes difficult to determine whether it is the preloreal or the postnasal. In the case of *G. burnettii* I do not know which it is. It is probably preloreal, since in the allied *G. multicarinatus* the inferior postnasal is sometimes wanting.

The typical characters of the head plates are important as definitive of the species, but their variations render it necessary to rely on other characters. The Sonoran and Western forms are more difficult to distinguish than the Toltecan. I append the following key, which will aid in their determination:

I. Dorsal scales larger than ventrals.

A. Two pairs of prefrontonasal plates.

α Two loreals.

No lateral prefrontonasals; elongate supraauricular processes; green, scales reticulated with black; below yellowish.. *G. auritus* Cope.

AA. One pair of prefrontonasal plates.

 α Two loreals. β Lateral prefrontonasals present.

Lateral prefrontonasals large; projecting supraauricular scales; nuchal scales in six rows; green, with angular brown cross bands.

G. vasconcelosii Bocourt.

Lateral prefrontonasals small; no projecting supraauricular scales; nuchal scales in six rows; green, with brown cross bands.

G. tenuatus Wiegmann.

 $\beta\beta$ No lateral prefrontonasals (postnasals present).

Six rows nuchal scales; above dark brown with transverse series of yellow spots..... *G. deppei* Wiegmann.

Four rows of nuchal scales; no granules in lateral fold, which does not extend on neck; green, with black reticulations on scales.

G. oazacæ Günther.

Four rows of nuchal scales; granules in lateral fold, which extends on neck; green; scales with black reticulations.

G. gramineus Cope.

II. Dorsal scales equal or smaller than ventrals.

A. Two pairs of prefrontonasal scuta.

 α Two loreals.

Lateral prefrontonasals, postnasals present; scales keeled, in from 49 to 55 transverse series on body, and 10 longitudinal rows on nape; above brown with more or less complete cross bands of black and white spots; form elongate.. *G. liocephalus* Wiegmann.

Lateral prefrontonasals and postnasals present; scales smooth in 16-18 longitudinal series; above brown, with yellowish-white rhombs on body; top of head yellowish white. *G. rhombifer* Peters.

 $\alpha\alpha$ One loreal.

Postnasals present; no lateral prefrontonasal; scales smooth in 10-12 longitudinal series; brown, sides darker *G. modestus* Cope.

AA. One pair of prefrontonasal scuta.

 α Two loreals. β Lateral prefrontonasals present.

Lateral prefrontonasals small; scales, only six or eight median rows, obtusely keeled, nuchals smooth, ten or twelve rows; light brown, with well-spaced dark-brown cross bands..... *G. kingii* Gray.

Lateral prefrontonasals small; all scales strongly keeled, nuchals in 10 rows; prefrontals in contact; light brown with 7 dark-brown cross bands on body *G. multicarinatus*¹ Blainville.

Lateral prefrontonasal small; all scales smooth or obsoletely keeled; nuchals in about 12 rows; yellowish olive, with 10 cross bands on body..... *G. nobilis* Baird and Girard.

 $\beta\beta$ No lateral prefrontonasals.

No postnasals; scales strongly keeled, nuchals in 12 longitudinal rows; 10 upper labials; dark brown, with ten to twelve darker cross bands on body *G. burnettii* Gray.

Postnasals present; scales weakly keeled, 10 nuchal rows; 11 upper labials; light brown, no cross bands; small lateral spots.

G. principis Baird and Girard.

 $\alpha\alpha$ One loreal (no lateral prefrontonasals; postnasals present).

Twelve nuchal rows, with all the dorsals, keeled; 11 upper labials; brown, with 10-12 darker bands; below olive.. *G. burnettii* Gray.

¹ Inferior postnasal sometimes wanting.

Eight rows of nuchal scales, with the dorsals, except three or four median rows, smooth; no supranasal, two postnasals; prefrontals broadly in contact; brown, with a blackish dorsolateral stripe; below yellowish, each scale with a black spot.. *G. monticolus* Cope. Eight rows of nuchal scales, with the lateral dorsal rows smooth; a supranasal, two postnasals; prefrontals separated by interfrontonasal; olive above, with black vertebral line; sides and lower surfaces black, spotted with greenish white.. *G. obscurus* Günther.

The distribution of these species is as follows:

ARCTOGEAN REALM.

MEDICOLUMBIAN REGION.

Western subregion.

Gerrhonotus principis Baird and Girard, *G. burnettii* Gray, *G. multicarinatus* Blainville.

Sonoran subregion.

G. multicarinatus Blainville, *G. kingii* Gray, *G. liocephalus* Wiegmann, *G. nobilis* Baird and Girard.

Toltecan subregion—Orizavan district.

G. taniatus Wiegmann, *G. deppei* Wiegmann, *G. gramineus* Cope, *G. oaxacæ* Günther, *G. liocephalus* Wiegmann.

NEOTROPICAL REALM.

CENTRAL AMERICAN REGION.

Guatemalan Plateau.

G. auritus Cope, *G. vasconcelosii* Bocourt? *G. modestus* Cope.

Costa Rican Plateau.

G. monticolus Cope, ? *G. rhombifer* Peters.

Species of this genus are less active in their movements than those of our Scincidæ and Teiidæ. I have observed the *G. multicarinatus* in its native forests, and found it not difficult of capture.

GERRHONOTUS GRAMINEUS Cope.

Gerrhonotus gramineus COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 179.—GÜNTHER, Biol. Centr.-Amer. Rept., p. 36, pl. XXIV, fig. B.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 269.

Two pairs supranasals; the posterior (or prefrontonasals) longitudinal, elongate, nearly equal to prefrontals; internasal smaller than frontonasals. Five short supraoculars, embracing three or four smaller scales. Six superciliaries. Eleven supralabials, the eleventh continuous with the swollen posterior temporal scales. Two postnasals, the smaller above the larger; one very large frenal, and one moderate preocular and three suboculars. Six in first, five in second row of infralabials. Muzzle not produced; plates of head thickened and roughened, especially elongated on the temporal and occipital region. Dorsal scales in twenty-three longitudinal series from nape to base of tail, and in thirteen

longitudinal rows; in form twice as long as wide, thick, with an obtuse keel, roughened in old specimens. Abdominal scales in twelve and fourteen series, smaller than dorsals; lateral fold very weak, including a few granules mixed with larger scales. Extended limbs overlapping the posterior, reaching wrist or palm. Lengths of fingers, beginning with the shortest, 1, 5, 2, 3, 4; of toes the same. Four preanal plates, rather larger than the abdominals. Scales of superior surface of tail not more strongly keeled than dorsals.

Above, bright pea green, each transverse series of scales blackish at the base and yellowish at the tips; rugosities of all scales black. Below, pale green, with a reddish tint in some, gular region and lower jaw yellow, abruptly separated from the green of the neck; eyelids yellow.

Measurements.—Length of head and body, 105 mm.; length of head, inclusive of postoccipital plate, 27 mm.; width of head at temporal region, 23 mm.; length to axilla, 44 mm.; length of fore leg, 32 mm.; length of fore foot, 13 mm.; length of hind leg, 40 mm.; length of hind foot, 19 mm.; total length of smaller specimen, with tail, 215 mm.; length of tail of small specimen, 130 mm.

This species has been found so far only in the elevated forests of the region about the volcano of Orizaba or Citlaltepēt. Its coloration is handsome, and is calculated to conceal it in forest vegetation. The same style of coloration characterizes the *Gerrhonotus auritus* Cope, which inhabits similar situations on the plateau of Guatemala. While referring to this species I correct an error into which Boulenger has inadvertently fallen in describing this species. He distinguishes it from the *Barissia fimbriata* Cope, which resembles it in the elongate yellow preauricular processes, by the presence of "three pairs of shields between the frontal and the rostral," while the *B. fimbriata* has "four pairs of shields." Now the *G. auritus* has four pairs of shields between the frontal and the rostral plates, and in my original description I stated that the second pair of internasals is divided—that is, there are two pairs of prefrontonasals. These, with the internasals, are exclusive of the prefrontals.

Gerrhonotus gramineus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
7083	2	Orizaba, Mexico.....	F. Sumichrast.....	Alcoholic.

GERRHONOTUS OAXACÆ Günther.

Gerrhonotus oaxacæ GÜNTHER, Biologia Centrali-Americana, Reptiles, p. 36, pl. XXIV, fig. A.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 268.

Gerrhonotus (Abronia) gramineus BOCOURT, Miss. So. Mex., Rept., 1878, p. 330, pl. XXI, A, figs. 6, 6a; not of Cope.

Head wide posteriorly; temporal and nuchal regions covered with projecting scales. Nasal scute separated from the rostral. Anterior

border of the tympanum furnished with flat or slightly convex scales. One pair of prefrontonasals and two small supranasals. Nine to ten pairs of supralabials. Mental divided. Dorsal scales larger than the ventrals and slightly swollen longitudinally. Lateral fold inconspicuous. Tail of medium length. General color greenish yellow, with wide black transverse bands.

Head flat above, depressed in the occipital region, covered with scales having the surface finely rugose; length from the end of the muzzle to the middle of the auricular opening equaling seven or eight rows of dorsal scales, and entering four and one-third times into the space comprised between the chin and the anus. Muzzle short, having two internasal scutes and two small supranasals; the two internasals are in contact in front with the rostral, and on each side with the first supralabial; the two prefrontonasals, of much larger dimension, are hexagonal; the interfrontonasal, which is smaller, is quadrilateral and is in contact in front with the two preceding, and behind with the prefrontals. The supranasals, very small, are situated one to the right, the other to the left, between the preceding scutes and the nasal scale. The prefrontals are hexagonal and are smaller than the prefrontonasals. The frontal is relatively short, obtusely angled in front, with a sharp posterior angle, which is truncate at the extremity by the interparietal, which is rather large, and is in contact in front with the frontal and the frontoparietal, on each side with a large parietal, and behind with three very narrow occipitals. The latter are followed by two rows of convex nuchal scales. Each of the supraocular demicircles is protected by eight projecting scales (five large and three exceedingly small) and is bordered exteriorly by a series of fine superciliary scales, of which the first is more developed than the others. Nostril pierced in the posterior part of the nasal plate; this latter is subrectangular and is in contact before with one of the internasals; above with the supranasal and upper nasoloreale, below with the first two supralabial plates, and behind with the inferior postnasal.

The loreal scutellum is rhomboidal and rests on a part of the third and fourth supralabial; the second loreal is large and irregularly hexagonal; the preocular is subquadrilateral and precedes two suboculars. There are nine or ten supralabials; the first seven or eight are quadrilateral, the following, rather higher, is pentagonal, and the last, a long one, has a sharp angle directed backward; the nine pairs of inferior labials are well developed. Aperture of the ear triangular, overhung by the projecting temporals, and bordered in front by three or four small convex scales and behind by scaly grains. Mental divided and succeeded on the right and left by four plates; those of the first pair in contact on their inner borders, and the outer borders of all separated from the inferior labials by one row of scales. The throat scales are flat and closely resemble those on the breast; on the sides of the neck they are tubercular; but the region above, between the ear and arm, is

covered with fine granulations. Lateral folds well marked, each starting in front of the arm and terminating at the side of the cloaca. Dorsal scales subquadrilateral, surmounted by a slight longitudinal ridge, forming thirteen or fourteen longitudinal series and twenty-five to twenty-seven transverse ones from the nape of the neck to the posterior border of the thighs; the cervical series contain but four scales, and not six, as in *G. taniatus*. The ventral plates are quite small, and form fourteen longitudinal series at the middle of the trunk. Cloaca bordered with four scales, slightly larger than those which precede them. Tail one-third longer than the head and trunk, encircled with twenty-six whorls of scales. Limbs similar to those of *G. taniatus*, both in dimensions and scaling.

Measurements.—Total length, 250 mm.; length of head from end of muzzle to the middle of ear, 23 mm.; length of head to border of temples, 18 mm.; length of body from chin to anus, 111 mm.; length of tail, 139 mm.; length of arm to the extremity of the middle finger, 26 mm.; length of leg to the extremity of the longest toe, 32 mm.

General tint, a greenish yellow; on the neck and trunk are six transverse black bands, very wide on the upper parts, and narrow on the sides where they join and disappear on the belly. On the tail the bands are very wide above, and become faint, narrow lines on the under side. The top of the head is ocher yellow, but the small, flexible protuberances on the scales are dark brown. The sides of the neck, from the temporal region to the junction of the arm, are black; there are small black spots on the supralabials, another spot, starting behind the eye, extending obliquely backward and downward. Lower surfaces of the body yellow, and the bases of the abdominal scales blackish.

M. Bocourt distinguishes this species from *G. taniatus* by the following peculiarities: The temporal and nuchal plates are more prominent, and present the appearance of grains of maize; the lateral scales of the neck and throat are larger and tubercular, while on the region above, from the ear to the junction of the arm, the scales are small and granular; finally, the first cervical series is composed of four elevated scales, and not six flat ones. Günther distinguishes it from the *G. gramineus*, with which Bocourt confounded it, by the following characters: The sides of the neck are covered with large irregular scales, separated from the nuchal scales by a naked span, with few granules; no granular scales in the lateral fold; dorsal scales considerably smaller, that is, in more numerous rows; ventrals smaller and more numerous.

Bocourt received this species from Mount Orizaba, where Sumichrast found it at an elevation of 3,000 meters. He also reports it from Oaxaca, whence also Günther has it. No specimens contained in the U. S. National Museum.

GERRHONOTUS TÆNIATUS Wiegmann.

Gerrhonotus tæniatus WIEGMANN, Isis, 1828, p. 379; Herpet. Mexico, 1834, p. 32, pl. ix, fig. 1.—DUMÉRIL and BIBRON, Erp. Gén., V, 1839, p. 399.—O'SHAUGHNESSY, Ann. and Mag. Nat. Hist., 1873, p. 45.—COPE, Proc. Amer. Phil. Soc., 1877, p. 96.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 270.

Abronia tæniatus GRAY, Cat. Spec. Liz. Coll. Brit. Mus., 1845, p. 53.

Gerrhonotus (*Abronia*) *tæniatus* BOCOURT, Miss. Sci. Mex. Rept., 1878, p. 327, pl. XXI, A, figs. 4, 5.

Head flat on top; wide behind and covered in the temporal regions with convex scales. Nasal scute separated from the rostral. Upper edge of the tympanum bordered with granular scales. One pair of prefrontonasal plates, a pair of internasals, and a supranasal. Eleven or twelve pairs of supralabials. Mental divided. Dorsal scales showing a slight longitudinal swelling, and larger than the ventral plates. Lateral fold small. Tail of medium length. Color greenish gray, with transverse bands of dark green.

Head rounded in the temporal region and covered with finely rugose scales; length to the middle of the auricular opening equal to eight dorsal scales, and entering four times and a half into the space from the chin to the anus. Muzzle covered with seven scales; the two internasals in contact with each other and anteriorly with the rostral and on each side with the first supralabial. The prefrontonasal is larger and is hexagonal. The interfrontonasal is equally large, and is hexagonal and in contact with six plates; in front with the prefrontonasals, behind with the two prefrontals, and on each side with the upper loreal plate, which in this species is recurved on the upper border of the muzzle. The supranasal is rectangular in outline, and is placed to the right and left above the nasal scute; the prefrontals are irregularly hexagonal, and each of them articulates behind with the frontal; the latter is relatively short, is obtuse-angled in front and sharply so at the back, with the point truncate and in contact with a narrow lozenge-shaped interparietal. The latter is in contact with six scutes; in front with the preceding and with two frontoparietals, on each side with a large parietal, and behind with the occipital. The occipital is in contact, right and left, with a postparietal scale, and is followed by two ranks of nuchal scales. There are five supraocular plates, which embrace three or four smaller scales between themselves and the superciliaries. The temples are prominent and are covered with convex scales. Nostril opening pierced at the posterior part of the nasal plate; the latter in contact anteriorly with the first labial plate and with the internasal; above with a small supranasal, below with the second supralabial, and behind with two small superposed nasoloreals. These latter are in front of one loreal or two superposed, of which the top one is the smaller and is recurved on the upper face of the muzzle; the freno-ocular is large and irregularly hexagonal; the lower side, rather narrow, rests on the fifth supralabial; the subquadrilateral

preocular is followed by three small suboculars. There are eleven or twelve supralabials; the first nine quadrilateral; the sixth, which is the highest, in contact with the preocular; and the three last larger and pentagonal. Auricular opening triangular, overhung by the temporal region and bordered in front and above by granular scales. Inferior labials in nine pairs; mental divided and followed on the right and left by four submaxillary plates arranged as in *G. deppii* and separated from the inferior labials by a row of longitudinal scales. The throat is covered with scales similar to those on the breast; those on the sides are smaller, and the region between the ear and the arm is covered with granular scales. Lateral fold slightly indicated, commencing on each side in front of the arm and ending at the cloaca. Dorsal scales subquadrilateral, with a slight longitudinal swelling, and forming fifteen longitudinal series, and from twenty-eight to twenty-nine transverse ones from the nape of the neck to the posterior border of the thighs; the cervical series are composed of six scales. Abdominal plates small, constituting twelve longitudinal rows; the anal region is bordered with six scales, of which the lateral ones are very small. Tail a little longer than the body and head and with eighty-five rings of smooth scales. Limbs relatively longer than those of *G. deppii*, but covered with similar scales. Claws short and hooked.

Measurements.—Total length of type specimen, figured by Wiegmann, 216 mm.; length of head, from end of muzzle to middle of ear, 20 mm.; width of head at the borders of the temples, 16 mm.; length of body, from chin to anus, 88 mm.; length of tail, 128 mm.; length of arm, to the end of the middle finger, 24 mm.; length of leg, to the end of the longest toe, 28 mm.

Neck and trunk a bright green with seven transverse brown bands, which are a little wider on the vertebral region than on the sides. The tail has fifteen bands of the same color. The upper surface of the head shows the color deepened to a greenish gray, and the temples are crossed obliquely by a black band. The inferior regions are yellow.

M. Bocourt, from whom the preceding description is mainly taken, remarks concerning this species "that in general appearance it resembles greatly *G. deppii*, from which, however, it is distinguished by the following characters: (1) Dorsal scales are not so large, somewhat swollen, constituting fourteen and not eleven longitudinal, less converging series; (2) two loreals, the upper slightly recurved on the muzzle; (3) different coloration, especially less brilliant."

A single specimen from Orizaba in the national collection agrees in every respect with the description of Bocourt except in the number of dorsal scales. Of these there are twenty-five transverse series and seventeen longitudinal. As the inferior row is composed of two scales to each single scale of a cross-row, perhaps they should not be counted; which leaves fifteen longitudinal rows. There is no superior loreal as in

Wiegmann's type, but the interfrontonasal is entirely inclosed by the prefrontonasals and prefrontals, as in the second specimen from the Berlin collection described by Bocourt. There are only four preanals.

Gerrhonotus tæniatus Wiegmann.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
1	Orizaba, Mexico	F. Sumichrast.....	Alcoholic.

GERRHONOTUS LIOCEPHALUS Wiegmann.

Gerrhonotus liocephalus WIEGMANN, Isis, 1828, p. 381.—BOCOURT, Miss. Sc. Mex., Rept., 1878, p. 342.—GÜNTHER, Biol. C. Am., Rept., p. 41.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 275.

Gerrhonotus tessellatus GRAY, Cat. Liz., 1845, p. 53.—WIEGMANN, Herpt. Mex., 1834, p. 32, pl. x, fig. 3; DUMÉRIL and BIBRON, Erp. Gén., V, 1837, p. 405.—AUG. DUMÉRIL, Cat. Méth. Coll. Rept. Mus. Paris, 1851, p. 143.

? *Scincus ventralis* PEALE and GREEN, Jour. Acad. Nat. Sci. Phila., VI, 1830, p. 233.

? *Gerrhonotus infernalis* BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 225; Emory's U. S. Mex. Bound. Surv., 1859, p. 11.

? *Gerrhonotus ophiurus* COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 321.

Gerrhonotus lemniscatus BOCOURT, Nouv. Arch. Mus., VII, 1872, Bull., p. 105.—O'SHAUGNESSY, Ann. Mag. Nat. Hist., XII, 1873, p. 45.

Pterogasterus ventralis COPE, Proc. Am. Phil. Soc., XVII, 1877, p. 96.

Pterogasterus tessellatus COPE, Proc. Am. Phil. Soc., XVII, 1877, p. 96.

Pterogasterus ophiurus COPE, Proc. Am. Phil. Soc., XVII, 1877, p. 96.

Pterogasterus infernalis COPE, Proc. Am. Phil. Soc., XVII, 1877, p. 96.

Pterogasterus lemniscatus COPE, Proc. Am. Phil. Soc., XVII, 1877, p. 96.

This handsome species is widely distributed in eastern and central Mexico, where it is represented by three well-marked subspecies, which may yet come to be regarded as true species. A fourth subspecies is found in western Texas, which differs less widely from the typical form. The characters of these subspecies are as follows:

One preocular, two loreals, posterior canthal descending to labials. Legs separated by length of hind leg. Belly immaculate; tail shorter..... *G. l. ventralis*.

No preoculars, two loreals, posterior canthal descending to labials. Tail moderate; extended legs separated by length of forearm; brown above, with ten cross bands; belly black spotted *G. l. liocephalus*.

Two preoculars, three loreals, not separated by the single posterior canthal; prenasal in contact with first labial. Tail 2.75 times head and body; extended limbs separated by length of humerus; red, with ten light cross bands V-shaped backward; belly black spotted *G. l. ophiurus*.

Three loreals, posterior canthal divided, each half corresponding to a loreal; prenasal separated from contact with first labial; tail twice head and body. Light olive, with seven or eight dark cross-bars; below yellowish marbled with olive.

G. l. infernalis.

The first subspecies is *Pterogasterus ventralis* Peale and Green,¹ and the typical specimen is from the Valley of Mexico. The *G. l.*

¹ Journal Acad. Nat. Sci., Phila., VI, p. 223.

ophiurus Cope is from the State of Vera Cruz, from which region, as well as from Puebla, Oaxaca, and Guanajuato, the typical *G. l. liocephalus* has been sent.

GERRHONOTUS LIOCEPHALUS INFERNALIS Baird.

Gerrhonotus liocephalus infernalis BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 255.

Body rather slender, very small, considerably depressed. Tail twice the head and body. Hind leg from knee equal to the head to ear. Dorsal scales in sixteen longitudinal and fifty-one oblique series; sixty-seven from chin to anus; tail with 127 whorls. Eight central or median dorsal rows of scales obtusely and faintly carinated (very obsoletely on the outer rows); central two or three rows on the tail similar; all the other scales perfectly smooth. Nasal plate applied only against the second labial and separated from the rostral. Three supplementary plates between rostral and internasal; the frontal hexagonal encircled by six plates. Four postnasal, the upper posterior very large and superior. Four loreals instead of one.

Above light olive, with seven or eight obscure bars of darker, bordered before or behind with bars of the ground color, edged faintly with whitish. Beneath yellowish, marbled coarsely with olive. Head plain. Tail nearly uniform reddish olive.

The single specimen of this subspecies exhibits peculiarities of cephalic plates which, if constant, will at once separate it from all other known North American *Gerrhonoti*. The head is depressed, running forward to an acute point; pyramidal; the length two-thirds the width, which is five-sevenths the length to ear, which in turn is rather more than one-fifth (about two-ninths) the head and body. The mouth is unusually pointed and depressed. The difference in the cephalic plates from those

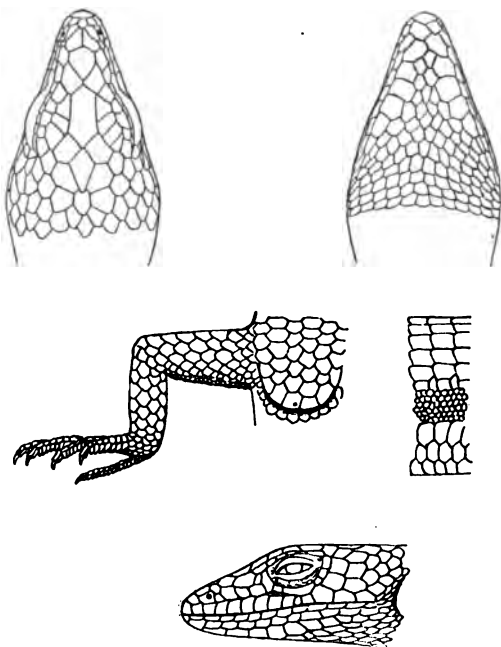


FIG. 91.

GERRHONOTUS LIOCEPHALUS INFERNALIS BAIRD.

=1.

TEXAS.

Cat. No. 13636, U.S.N.M.

of *G. multicarinatus* appear to be caused by the development of three additional plates just back of the rostral, and the unusual size and more superior position of the upper posterior postnasal. The three supplementary rostral plates are all in contact anteriorly with the rostral; the median largest, separating the anterior pair of internasals, and in contact behind with the two posterior internasals which are in apposition. The lateral supplementary plate separates the nasal entirely from contact with the rostral and the first labial, the nasal being restricted to the second labial. The posterior pair of internasals is large; longer than broad; bounded externally by the displaced anterior internasal and the upper first postnasal. The upper second postnasal is very large and on the canthus rostralis; almost entirely on the upper surface of the head. The frontal is hexagonal and encircled by six plates, in front by the posterior internasals, laterally by the upper posterior postnasal (as large as the lower), and behind by the postfrontals; of these the latter are rather largest, the others nearly equal. The usually single loreal is replaced by four small plates, the anterior upper largest; the posterior upper smallest; the two lower square, equal, and forming a kind of border to the upper labials. There are nine labials to the posterior infraorbital, instead of eight. The supraorbital plates are five and three.

The general color above is a dull, light greenish or true olive, with about seven obscure bands across the back and sides between head and tail, covering a width of some two scales. On the sides some of the scales adjacent to these dusky bars (not always the posterior ones) are edged with dull clayey whitish. The tail is scarcely varied anteriorly, only there are some traces of the whitish edges. The under parts are light yellowish, obscurely marbled with the ground color of the back. The head is entirely uniform olive, except below.

The lateral blotches are somewhat peculiarly constituted. The pattern is as if there were one vertical row of scales of a plain dark brown, and another behind this of the lighter ground color edged with whitish, the two then broken midway and the lower half transposed, so that on one row the lower scales are whitish, the upper brown; while in that posterior to it the lower are brown, the upper whitish; the succession below being thus white and brown, and above brown and white. The perfectly plain intervals cover about four rows.

This lizard occurs throughout the first plateau country of Texas from the Rio Grande to the Red River. It has been found on the Helotes Creek by Mr. Marnock, and in Wichita County by Mr. Boll. I did not see it living; it is rather rare, and is said to inhabit rocky places. There is no evidence of its occurrence outside of Texas in the United States. It is not known to occur within the proper limits of the Sonoran subregion, but is common in the Tampican subregion of the Central American region of the neotropical realm. It must be regarded as an invader from that realm, but it ranges much farther north than any of the other forms of that fauna.

Gerrhonotus liocephalus infernalis Baird.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3090 13636	1	Devils River, Texas	Dr. C. B. R. Kennerly	Alcoholic.

GERRHONOTUS NOBILIS Baird and Girard.

Gerrhonotus nobilis BAIRD, U. S. Mex. Bound. Surv., II, Reptiles, 1859, p. 11, pl. xxv, figs. 1-8.

Elgaria nobilis BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, August, 1852, p. 129; Fort Webster, New Mexico.

Body slender, very small, much depressed. Tail two and one-fifth times the head and body. Dorsal scales in fourteen longitudinal and fifty-eight oblique series; sixty-two from chin to anus. Tail with 131 whorls. Scales all entirely smooth, or the middle dorsal rows with a very blunt obsolete carination. Frontal plate rhomboidal; large, separating the internasals from the postfrontals. Two pairs of internasals and two of postnasals. Supraorbitals in scales of 5 and 3. Hind leg from knee equal to distance from snout to ear, which is one-fifth the head and body.

Ground color light yellowish olive; back with ten broad bars (three scales wide) edged behind with black, having a whitish margin posteriorly. Tail with thirty half rings of the same, changing behind into blotches. Sides with narrow black bars, on a light ground. Beneath greenish white, each scale spotted with blackish.

The frontal plate of this species is smaller than in many others of the section, although it separates the posterior internasals from the postfrontals, the gap between them filled up by the upper posterior postnasal. It is quite probable, however, that occasionally the posterior internasals and the postfrontals may come into actual contact, as the former are considerably longer than in *G. multicarinatus*. I do not perceive any other special peculiarities in the cephalic plates. The

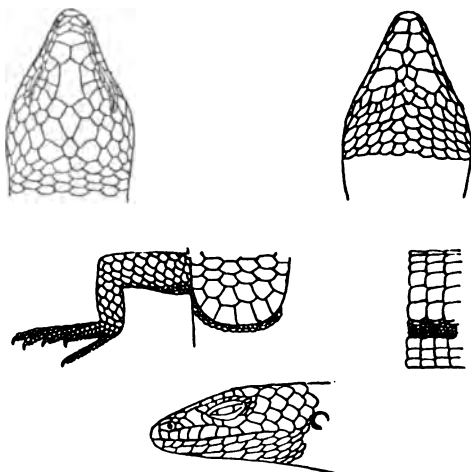


Fig. 92.

GERRHONOTUS NOBILIS BAIRD AND GIRARD.

= 1.

Arizona.

Cat. No. 8763, U.S.N.M.

head is pointed and depressed; the height scarcely two-thirds the width, which is rather more than two-thirds the head to the ear. The tibial joint is very short; all the limbs unusually feeble; the fore legs extended forward do not reach to the eye, while in *G. multicarinatus* it reaches to the nostrils.

The upper parts are of a light yellowish olive; the back with about ten transverse broad bars covering two or three rows of scales; the tail with about twenty-nine or thirty of the same. These are of a darker, more reddish olive than the ground color, suffused with brownish black behind, less conspicuously in front and the interval spotted with dark brown. They are margined posteriorly (on the edges of scales) with clayey white. Several of those along the middle of the back are broken above and the branches displaced or alternating. On the sides the posterior black border of the dorsal bars with their whitish edging is continued down to the fold on a single scale. There is almost nothing of this, however, on the side of the tail, except a slight shade of the lighter portion. The sides of the same are marked alternately with seven or eight olive and white spots, the former edged before and behind with black. The plates of the head above are blotched with dark brown. There is no trace of a dusky wash along the sides. The under parts are olivaceous white, each scale, except along the middle of chin and throat, with a black spot.

Dr. Boulenger identifies this species with the *G. (Elgaria) kingii* Gray (*G. multifasciatus* of Duméril and Bibron). He, however, describes that species¹ as having six or eight median dorsal series of scales, keeled, which is not the case with the *G. nobilis*.

Gerrhonotus nobilis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8763	1	Ralston, Arizona	Nov. —, 1873	Dr. C. G. Newberry	Alcoholic.
3083	2	N. P. R. R. Survey .....	.....	Governor Stevens	do.
3076	2	Sonora, Mexico .....	.....	Captain Minos	do.

GERRHONOTUS MULTICARINATUS Blainville.

Gerrhonotus multicarinatus BLAINVILLE, Nouv. Ann. Mus. Hist. Nat., 1835, p. 289, pl. xxv, fig. 2.—DUMÉRIL and BIBRON, Etp. Gén., V, 1839, p. 404.—HALLOWELL, Rept. U. S. Expl. Surv. R. R., X, Pt. 4, 1859, pl. ix, fig. 1.—BOCOURT, Miss. Sci. Mex., Rept., 1878, p. 357, pl. xxi c, fig. 5.

Cordylus (Gerrhonotus) multicarinatus BLAINVILLE, Nouv. Ann. Mus., IV, 1835, p. 289.

Gerrhonotus ceruleus WIEGMANN, Isis, 1828, p. 380; Herp. Mex., p. 31.—BOCOURT, Miss. Sci. Mex., Rept., 1878, p. 353, pl. xxi c, fig. 3.—GÜNTHER, Biol. C. Am., Rept., p. 38.—GRAY, Cat. Liz. Brit. Mus., 1845, p. 54.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 273.

Gerrhonotus wiegmanni GRAY, Cat. Liz. Brit. Mus., 1845, p. 54.

Tropidolepis scincicauda SKILTON, Am. Journ. Sci. 2d ser., VII, 1849, pp. 202, 312.

¹ Cat. Liz. Brit. Mus., II, p. 268.

- Elgaria scincicauda* BAIRD and GIRARD in Stansb. Exped. Gt. Salt Lake, 1852, p. 348; U. S. Explor. Exped. (Ch. Wilkes), Herp., 1858, p. 210, pl. xxiii, figs. 1-9.
- Elgaria grandis* BAIRD and GIRARD, Stansb. Exped. Gt. Salt Lake, 1852, p. 176.—GIRARD, Wilkes Expl. Exped., 1858, p. 212, pl. xxii, figs. 1-9.
- Elgaria marginata* HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1852, p. 179; Sitgreaves, Expl. Zuni and Colo. River, 1853, p. 114, pl. iii; young specimen.
- Gerrhonotus webbi* BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 255; U. S. Mex. Bound. Surv. Rept., 1859, p. 11, pl. xxiv, figs. 1-10.
- Gerrhonotus (Elgaria) grandis* O'SHAUGHNESSY, Ann. Mag. Nat. Hist. (4), XII, 1873, p. 47.
- Gerrhonotus (Elgaria) scincicauda* O'SHAUGHNESSY, Ann. Mag. Nat. Hist. (4), XII, 1873, p. 47.
- Gerrhonotus (Elgaria) formosus* O'SHAUGHNESSY, Ann. Mag. Nat. Hist. (4), XII, 1873, p. 47.
- Gerrhonotus (Elgaria) principis* O'SHAUGHNESSY, Ann. Mag. Nat. Hist. (4), XII, 1873, p. 47.

Two pairs of internasals and two of postnasals, the hinder pair sometimes fused into one. Frontal separating widely the postfrontals and internasals. Supraorbitals in two series of five and three. Head very broad and swollen behind, where the width is more than two-thirds length to ear. Hind feet from knee equal or a little greater than this distance. Tail two and one-fourth to two and one-half times the head and body (in Cat. No. 3102a).

Dorsal scales in fourteen transverse and forty-seven to fifty longitudinal series. Scales all prominently carinated, the carinae equidistant; scales on anterior as well as upper face of limbs showing more or less carination, as also the sides of the tail.

Color above yellowish brown or gray, with a series of ten to fourteen blackish rings, continued quite distinctly across the back, and spotted behind with white even in the median region.

This is a variable species, so much so as to have given rise to a number of synonyms. It was first described from a young specimen by Wiegmann as *G. caeruleus*, a name which is absolutely erroneous as applied to the species in general. Another young individual gave rise to the synonym *G. webbi* Baird.

In this species the body is cylindrical or subquadrate, rather depressed; the belly flattened. There is a decided constriction at the neck; the head as wide as the body, a little broader than high; the width two-thirds the distance from muzzle to ear, which again is two ninths the head and body. The tail is excessively lengthened, two and one-third times the head and body, though frequently much shorter owing to the breaking off and reproduction in a stump of the tail. This is shaped like the body, though less depressed; and without the soft skin of the sides, though with a shallow groove. The feet are short and feeble.

On each side the body is a fold or strip of soft skin paved at intervals with small oval scales, with still smaller ones between them, especially on the sides. This begins at the ear and extends backward to the root of the tail, the legs being implanted in it. On the sides it

is about one-fifth the width of the belly sheet and is generally concealed by the folding of the latter over the sides of the dorsal. The two lateral strips of soft skin separate a dorsal and ventral sheet or plate which are very stiff and firm, the former rather broader than the latter. The scales on the sheets are arranged in transverse series, the dorsal, however, with a slightly backward direction on the median line. The scales on the tail are regularly whorled.

The plates on the head are large and regular. There is a long narrow vertical, concave on each side, wider behind (where it is truncated

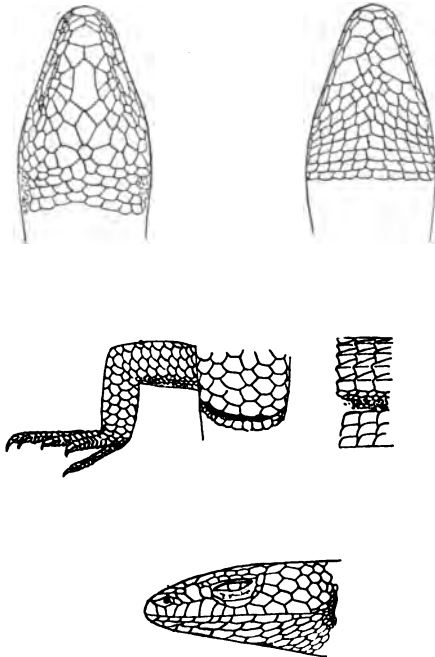


Fig. 93.

GERRHONOTUS MULTICARINATUS BLAINVILLE

=1.

California.

Cat. No. 7909, U.S.N.M.

and three sided) than before, where it is two sided and obtuse angled. There are two post-frontals, a frontal, and two pairs of short, broad internasal plates to the rostral. The frontal is broad, rhomboidal, truncate laterally, and separates evenly the postfrontals and internasals. There is a large inner supra-orbital series of five plates, with a smaller of three in its external concavity. It is bordered externally on the upper edge of the head by six plates. The nostrils are lateral in a single plate next to the first and second labials, with two small plates behind it, succeeded by a third postnasal, in most specimens divided into two; next comes a large loreal and a smaller ante-orbital to the eye. There are ten upper labials and nine or ten lower. The infraorbitals are two; the postorbitals in two successive series of three and

four small plates; then comes four vertical series to the ear. There are three median occipital plates in line with the vertical (sometimes only two), anterior largest, and three plates on either side larger than the rest. The distinction between plates of head and neck is, however, very slightly marked. Above it may be known by the transition from the single occipital plate to the double dorsal series. There is a very slight tendency only to imbrication in the cephalic plate.

The scales in the dorsal sheet are all conspicuously carinated, the upper ones very obtusely mucronate. There are fourteen ridges and rows of scales on the dorsal plate, all the scales quite equal in size,

about forty-eight from occiput to above anus. There is no median dorsal ridge or row of scales, the scales forming an even number. There are about one hundred and thirty-six series of whorls or scales on the tail, all carinated except on the under surface. On the belly sheet are twelve series of scales, which are about as wide, but rather shorter than the dorsal, and consequently the whorls not continuous all around the body as they are on the tail. There are about sixty-three series of scales from the chin to the anus, about nineteen or twenty of them belonging to chin and throat. The lower labials are margined internally by a series of wider plates, and these again by a series three times their width.

The legs are weak and covered with overlapping scales, those on the inner surface smaller. The posterior surface of the thighs and humerus is like that of the lateral fold. The scales on the upper and anterior surface of the legs are carinate; those in the soles are smooth and tubercular. The digits on each foot are all unequal except the third and fourth, which are nearly equal and longest. The hind leg is but little longer than the fore; the forefoot about two-thirds the hinder.

The scales are all hard and bony plates, very firm and distinct, covered by a thin epidermis.

The cephalic plates are quite smooth in the young. With age they become wrinkled longitudinally, and the posterior extremities more angular, elongated, and imbricate. The upper parts are barred with a succession of reddish, black, and pale yellowish rings in such a manner as to render it difficult to say what is the ground color. There are about twelve narrow black rings on a single whorl from head to tail (and thirty-six or more on the tail). Each is bordered behind by grayish or yellowish white, usually on the edges of the same scale. These rings of black and white, though usually only the width of a single whorl, are not entirely regular, passing sometimes from one whorl to another. Anterior to the black the color is sometimes quite deep red, sometimes light brown, passing gradually forward to the next ring into light olive gray. The under parts are light greenish olive, the edge of the scales paler.

The red of the dorsal intervals usually fades in a whorl to a shade of brownish olive. The light edging to the black often tinges the base of the scales behind it and has much the character of specks of thick white-lead paint.

The supposed differences between this species and *B. scincicauda* disappear on comparison of a large series of specimens. Some from Monterey, California, agree with the types in the very thick head, but the coloration being perhaps more like that of the types of the supposed *G. scincicauda*.

The common *Gerrhonotus* of northern California is very closely related to that found at San Diego, and although a comparison of a large series conveys a general impression of difference, they are not capa-

ble of exact and intelligible definition. The northern form, on the whole, is smaller, with a shorter tail, and decidedly more slender head and body. The scales are smaller, as shown by an average of 51 in a series instead of 47. They are less prominently carinated, especially on the arms and legs.

The color appears to differ in the more indistinct dorsal bands, which are usually more or less effaced along the back, where they also lack the distinct white specks bordering the black behind.

The form called *G. grandis* is distinguished from the types of *G. multicarinatus* by its greater smoothness, the absence of white spots on the back, and the more uniform olive-brown color.

It is smoother than the types of *G. scincicauda*, the hind legs a little longer, the scales smaller, the frontal shorter, the tail apparently longer. The coloration is very different, being of a uniform clear brown olive, with dusky bars shading gradually into paler below, and sharply spotted on the sides with white. It is not, however, distinguishable, in my opinion, from the typical forms either as species or subspecies.

A specimen from Fort Tejon (Cat. No. 4129) differs quite decidedly from the types in having the head and body narrower and more elongated; the head to ear is not one fifth the head and body. The width of the head is not two-thirds the distance from snout to ear, which is one-fifth the head and body. There are 52 scales in a line from occiput to above anus, and 63 from chin to anus. The ridges of the scales on the sides are quite obsolete; those on the legs perfectly smooth, except a few faint indications on the upper edge. The legs are very feeble, the distance from the knee to the end of toes being equal to that from snout to ear; from elbow to end of claw is four-fifths this distance. There are about thirteen bands from head to anus. The bands on the back are more distinct and a good deal spotted behind with white.

The geographical range of the *Gerrhonotus multicarinatus* is the Pacific district from Puget Sound to San Diego, California, and as far as the southern extremity of the Lower Californian peninsula. According to Mr. T. S. Palmer, the present form is confined to the chaparral belt. Stejneger is of the opinion that the Cape St. Lucas form is specifically distinct from the Californian, but I have not been able to substantiate the difference. He uses for the latter the name *G. scincicauda* Skilton.

Gerrhonotus multicarinatus Blainville.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
3104	1	California.....		Dr. Le Conte.....	
3097	5	San Diego, California.....		Dr. Hammond.....	
3091	3	do.....		Lieut. W. P. Trowbridge, U. S. A.	
3094	1	do.....		do.....	
3085	2	California.....		Captain Williamson.....	
3099	1	do.....		Governor Stevens.....	
4131	1	Fort Tejon, California.....		J. Xantus.....	
3098	1	Monterey, California.....		Lieut. W. P. Trowbridge, U. S. A.	

Gerrhonotus multicarinatus Blainville—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
3082	1	Monterey, California		William Taylor	
7909	1	do		Dr. Canfield	Alcoholic.
9361	1	San Diego, California		J. G. Croser	do.
9364	2	Fort Tejon, California		J. Xantus	do.
9362	1	Mexican Boundary Survey		do	do.
8338	1	California		L. Stone	do.
9363	1	do		do	do.
11972	1	La Paz, Lower California	—, 1882	L. Belding	do.
3085	1	Presidio, California		Lieut. W. P. Trowbridge, U. S. A.	Type.
3107	1	San Francisco, California		U. S. Explor. Expedition	
3077	1	Feather River, California		J. S. Bowman	
3081	2	Fort Reading, California		Dr. Hammond	
3089	1	Oregon		do	
3093	2	San Francisco, California		R. D. Cutts	Select.
3100	1	Bodega, California		Dr. J. S. Newberry	
9335	1	Northwest Boundary		Dr. C. B. R. Kennerly	Type.
8622	3	California	—, 1875	Dr. H. C. Yarrow	do.
8625	4	Santa Barbara, California	July —, 1875	H. W. Henshaw	do.
8626	2	Santa Cruz Island, California	June —, 1875	do	do.
10785	1	San Francisco, California	—, 1880	Prof. D. S. Jordan	do.
9057	1	Oregon		U. S. Explor. Expedition	Alcoholic.
3107	1	San Francisco, California		Dr. S. W. Woodhouse	do.
9336	1	Feather River, Oregon		do	do.
9051	1	Northwest Boundary Survey		Dr. C. B. R. Kennerly	do.
5134	2	Puget Sound, Oregon		do	do.
3087	8	Petaluma, California		E. Samuels	do.
3092	6	do		do	do.
16338	1	San Diego County, California		C. R. Orcutt	
16342	1	do		do	

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When collected.	From whom received.
			Feet.	1891.	
18616	Female.	Three Rivers, California		July 28	Fisher.
18617	Female.	Kaweah River, East Fork, California	3,600	July 27	Bailey.

Catalogue No.	Number of specimens.	Locality.	From whom received.
20210		Witch Creek, Santa Ysabel, San Diego County, California	H. W. Henshaw.
20349		Witch Creek, Sta. Isabel, San Diego County, California	H. W. Henshaw.
20384		do	do.
21540		San Diego, California	A. W. Anthony.
22000		Jacumba Hot Springs, San Diego County, California	Dr. E. A. Mearns.
22001-2		San Ysidro Ranch, Lower California	do.
22003		do	
22004		Jacumba Hot Springs, San Diego County, California	do.
22582-3		Near San Diego, California	C. R. Orcutt.

GERRHONOTUS MULTICARINATUS PALMERII Stejneger.

Gerrhonotus multicarinatus palmerii STEJNEGER, North American Fauna, No. 7, Pt. 2, 1893, p. 196.

Dr. Stejneger describes this species as follows:

Similar to *G. scincicauda*, but body much less elongated and coloration above essentially different, being, according to age and sex, either uniform dark olive brown with numerous black and white dots on the sides, or pale bluish drab clouded with numerous ill-defined and irregular blotches of brownish drab, blotches not arranged in cross bands.

The general aspect of this form is strikingly different from all the other Californian *Gerrhonoti*, and this difference is equally well marked in the youngest specimen and in the oldest. I have before me a nearly unbroken series of ten specimens, from a very young one, with a body only 40^{mm} long, up to the dark old males, and none of them can for an instant be mistaken for the typical *G. scincicauda* from the lower valleys. The whole figure is shorter and more thick set, and the broad and rather distant cross bands on the back are conspicuously abrupt, the coloration being either uniform dark or else an ill-defined, often obscure, 'pepper-and-salt' mixture. Only in one specimen (No. 18612) is there a more definite arrangement of the light and dark spots, but these ill-defined cross bands are much more numerous than in *G. scincicauda*, being about fifteen on the back (between anterior and posterior limbs) as against nine to ten in the latter. A similar pattern may also be traced in the youngest specimen referred to (No. 18613), with a similar result.

Most of the *Gerrhonoti* brought home by the Death Valley expedition belong to this form, of which there is no specimen in the Museum collection from any definite and undoubted locality before, and all the specimens of the expedition were collected in a comparatively small area near the headwaters of the Kern, Kings, and Kaweah rivers, at an altitude of from about 7,000 to 9,000 feet above the sea.

It might seem strange that there should be no name available among the many defunct synonyms of Californian *Gerrhonoti* by which to distinguish this form, but the fact seems to be that most of the specimens so far brought to the notice of herpetologists have been collected in the lower altitudes, while the present form seems to be restricted to the higher altitudes of the Sierra.

Habitat.—High elevations of western slope of southern [only?] Sierra Nevada.

Type.—Cat. No. 18606, U.S.N.M., male adult. South Fork Kings River, California, T. S. Palmer collector.

Gerrhonotus multicarinatus palmerii Stejneger.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When collected.	From whom received.	Nature of specimen.
			<i>Feet.</i>			
18606	Male ...	South Fork Kings River, California.			Palmer	Type.
18607	Female.	East Fork Kaweah River, California.	18,800	Aug. 8	Bailey	
18608	Female.	do	18,800	do	do	
18609	Male*	do	18,500	Aug. 1	do	
18610	Male ...	Soda Springs, North Fork Kern River, California.	7,200	Sept. 6	Nelson	
18611	Female.	do	7,200	do	do	Near Ka- weah saw- mill.
18612	Female.	North Fork Kern River, California.		Sept. 15	do	
18613	Male*	Soda Springs, North Fork Kern River, California.		Aug. 15	Bailey	
18614	Female.	Sequoia National Park, California.	17,000	Aug. 2	Fisher	
18615	Female.	Mineral King, California.	18,000	Aug. 6	Bailey	

* About.

* Young.

GERRHONOTUS BURNETTII Gray.

Gerrhonotus burnettii GRAY, Griffith's Cuvier's Animal Kingdom, IX, Syn., 1839, p. 64; Beechey's Voy., Rept., 1839, p. 96; Cat. Liz. Brit. Mus., 1sted., 1845, p. 54.—O'SHAUGHNESSY, Ann. Mag. Nat. Hist., 1873, p. 45.—STEJNEGER, N. Amer. Fauna, No. 7, Pt. 2, 1893, p. 197.

Elgaria formosa BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, October, 1852, p. 175; California.—GIRARD, Herpt. U. S. Expl. Exp., 1858, p. 206, pl. xxiii, figs. 10-17.—O'SHAUGHNESSY, Ann. Mag. Nat. Hist. (4), XII, 1873, p. 47.

Dorsal rows of scales about sixteen longitudinal and forty-eight oblique. The lowest lateral row as wide as that above it. Interfron-

tonasal moderate, rhomboid encircled by the post-internasals and pre-frontals, the latter larger than former. Only two postnasals. Supra-orbitals five and three. Dorsal scales all strongly carinated (rather less on the sides), even on the neck. Sides of tail and upper edges of limbs weakly keeled.

Above, greenish ash. Sides with twelve vertical black bars distinctly margined behind by white. Six median dorsal rows, with a central row of small dark spots; seldom obscuring the transverse bands, and without white spots.

The head is short and broad; the width three-fourths the distance from snout to ear, which is one-fifth the head and body. There are forty-seven scales from head to above anus; rather more slightly carinated on the sides than above. There are fourteen dorsal rows of

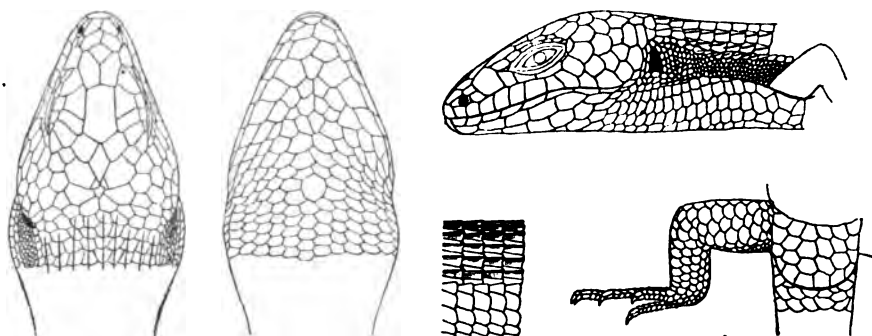


Fig. 94.

GERRHONOTUS BURNETTII GRAY.

× $\frac{1}{2}$.

California.

Cat. No. 4131, U.S.N.M.

scales, but a fifteenth is seen at intervals along the dorsal line, and there should really be a sixteenth. The cheek scales are smooth, those on the upper edge of the legs faintly carinated. The surface of the head is slightly arched or convex; the plates not very smooth. The four internasals are large, in two rows, which are as long as broad. The frontal is very small, rhomboidal; completely embraced between the postfrontals behind and the posterior row of internasals before, which are in contact, a very peculiar feature. There are but two postnasals and a large loreal. The hinder feet from knee are equal to distance from snout to ear; the forefeet from elbow are a little less.

The ground color is a light greenish gray or ash, with a series of about twelve vertical black bars, spotted with white, on each side, the bar the width of a single scale, but sometimes passing from one to another. A dorsal span of about six scales in width is without bars, but with a series of thirteen or fourteen subquadrate dark blotches, not

quite ten scales wide and one long. The legs are faintly blotched; the head very slightly.

The peculiarities of this species are its very small interfrontonasals, two postnasals only, the indication of a fifteenth dorsal row of scales, the greenish-ash color, without transverse dorsal bands, and with the blackish instead of white dorsal series.

In the type specimen (Cat. No. 4132) there are forty-eight rows of scales on sixteen transverse series. The interparietal is very small and elongate rhomboidal. The frontal is rather larger, but its general characters the same.

A series of ten specimens from Fort Point, near San Francisco, differ slightly, though probably the same as *E. formosa*. They are rougher and more sharply carinated on the back. The head is nearly as deep as broad; the width, however, scarcely two thirds the length (thus narrower). The legs are short; the anterior from the elbow about three-fourths the distance from snout to ear, or decidedly less than in the type; the hinder from knee about equal to this distance. The snout to ear is about two-ninths in the head and body, or a little longer in proportion.

The interparietal is narrow, lozenge-shaped. The interfrontonasal, though large, is embraced between or encircled by the two postfrontals and the two post-internasals, which are long. Anterior to the frontal is a smaller median plate in contact with it and the rostral, and separating the anterior internasals; this, however, is probably not regular. If constant it will establish the species. There are two small postnasals and three large outer supraorbitals, besides the five on the external edge, as in the type.

There are sixteen dorsal series of scales, all about of equal width, and the scales in the upper edge of the soft fold just below this are decidedly larger than those of the others. The dorsal ridges are all very distinct and well defined, most conspicuous on the back, where they almost form a mucro. The scales on the upper part of the cheeks and those on the back and sides of neck are distinctly carinated, as are those on the upper edge of the limbs and on the tail, except on the lower surface.

There are about fifty-one scales from occiput to tail and sixty-two from chin to anus. This is an appreciably greater number than in the type, and is worthy of consideration.

The ground colors in this are of an olivaceous reddish gray. There is a dorsal stripe of six and two half scales wide, lighter than the ground color, becoming still lighter, turning almost into a white stripe externally. On each side below this light space are about fourteen approximately vertical but rather broken black bars, sharply margined behind with white, each a single scale in width. On the back, and connecting these lateral bars, is a series of fifteen transverse dusky ones, slightly concave anteriorly, but rather irregular. The suborbitals are black, edged below with white; the labials are black and white. The under parts are greenish white. There is no white whatever on the back.

This variety is readily distinguishable from *E. principis* by the much rougher scales, and the equality of the lower lateral scales to those above them, as well as by its more compressed body, two postnasals, and the white edges to the lateral scales. It is very similar to the type specimens of *E. formosa*, having the sixteen rows of scales above and the two postnasals. The chief difference is in a greater number of scales in a dorsal series (51), narrower head and shorter fore legs, and the ground color brownish olive instead of greenish ash, with a series of fifteen transverse dorsal bars instead of thirteen or fourteen spots.

In his report of the Death Valley expedition, Dr. Stejneger states that—

This form is only distantly related to *G. multicarinatus*, but very closely to *G. principis*, so close, in fact, that I believe that the name of the latter will become reduced to a trinomial when the geographical distribution of the two forms shall have been ascertained in all its details. *G. burnettii* is now known to occur along the coast at least from Monterey to Humboldt Bay. How far inland it extends its range, and how and where it meets or grades into *G. principis* is as yet undeterminable. One thing is certain, however, and that is, that the range of *G. burnettii* and *G. multicarinatus* overlap considerably, and in this fact alone I see sufficient proof of their specific distinctness. The differences between them are certainly due neither to sexual, nor to seasonal, nor to individual variation, great as the latter is in the *Gerrhonoti*.

Gerrhonotus burnettii Gray.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4131	1	Petalumna.....	.....	Samuels.....	Type.
4132	1	Upper California.....	.....	U. S. Exploring Expedition.	
3080	1	Westpoint, California.....	.....	Lieutenant Trowbridge.	Type.
3085	1	Presidio, California.....	.....	do.....	

GERRHONOTUS PRINCIPIS Baird and Girard.

Elgaria principis BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, October, 1852, p. 175; Oregon.—GIRARD, Herpt. U. S. Expl. Exp., 1858, p. 214, pl. XXII, figs. 9-16.—O'SHAUGHNESSY, Ann. Mag. Nat. Hist., 1873 (4), XII, p. 48.

Dorsal rows of scales sixteen, the lowest about half that adjacent to it. Ventral rows twelve. Frontal very small, lozenge-shaped, completely surrounded by the post-internasals and prefrontals; nearly equal in size. Two postnasals, the upper sometimes confluent into one. Supraorbitals 5 and 2. Scales obsoletely carinated; nearly smooth on the head, neck, sides of body (lowest rows), and of tail, as well as on legs. Hind feet from heel longer than from snout to ear; width of head two-thirds this amount. Forty-eight scales from head to tail. Tail nearly twice the head and body.

Above light brownish olive; the sides with obscure darker vertical bars, broken up into spots and without white edges behind. A median row of 16 or 18 dark spots, representing as many bands on the sides. Beneath greenish yellow white.

Body much depressed and unusually smooth. Head much depressed, the depth about three-fourths the width, or less, the width more than two thirds the distance from snout to ear; occipital lozenge-shaped; vertical lengthened; frontal small, completely embraced by the post-frontals and post-internasals in contact and of about equal size. Two pairs of postnasals. Inner large supraorbitals usually four, embracing two in their concavity, not three. Fore legs from elbow rather less, hinder from knee rather more, than the distance from snout to ear, which is from one-fourth to one-fifth the head and body. The tail is not quite twice the latter distance. There are sixteen longitudinal rows of dorsal scales, the lowest about half that adjacent to it. There are about 48 scales from head to tail above, 55 from chin to anus. The scales are everywhere remarkably smooth; the carination quite inap-

preciable on the back, though each scale is slightly and obsoletely keeled. On the sides this does not extend to the posterior edge, and it is wanting on the lowest row. All the plates of the head and neck, as well as of the limbs, are smooth or with an inappreciable trace of carination.

This species is distinguished from *G. burnettii* likewise, by having sixteen rows of scales above, by the possession of four postnasals (although sometimes the two upper are fused into one long one, leaving three) instead of two. This lengthens the muzzle, which is more depressed. There are only two

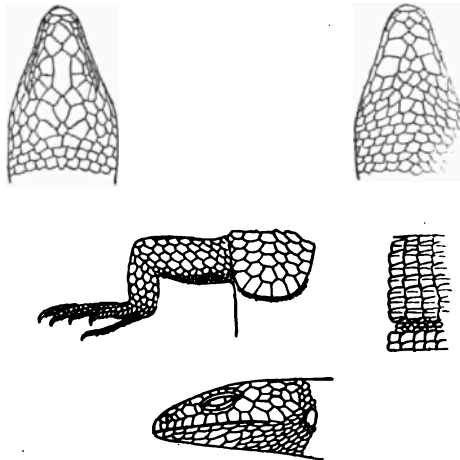


Fig. 95.

GERRHONOTUS PRINCIPIS BAIRD AND GIRARD.

=1.

Cat. No. 3086, U.S.N.M.

outer supraorbitals instead of three. The lower row of lateral scales is only half as large as the next instead of nearly equal to it. The carination is much more obsolete, being entirely wanting in the back of the neck, and in some other regions distinctly keeled in *G. burnettii*. The body is much more depressed.

This species is of a light reddish, olive brown, the sides for about four or five rows of scales blotched with dusky, nearly black above, and not constituting distinct regular vertical bars; the remnant of a continuous lateral stripe from the snout, and least effaced above. The back has an irregular median series of rounded dusky blotches, sprinkled more distantly elsewhere. There are traces of sixteen or eighteen of the lateral and dorsal dark blotches. The under parts are yellowish white, with a tinge of greenish. The edges of the cephalic

plates are suffused with dusky. These are only blotches. No rings on the tail.

There is generally no indication of white edges to any of the scales; in one or two specimens only is there an occasional and faint trace of this.

Gerrhonotus principis Baird and Girard.

Catalogue No	Number of specimens.	Locality.	From whom received.
3103	3	Tolot Plains.....	Governor Stevens.
1082	2	N. P. R. R. Survey	do.
3106	1	Oregon	do.
2084	1	Puget Sound.....	Governor Campbell.
15184		Nanaimo, British Columbia.....	U. S. Fish Commission.
15940		Port Townsend, Washington.....	do.
16183-8		Seattle, Washington.....	O. B. Johnson.
22391		Sicamous, British Columbia.....	John Macoun.
22410-11		Vancouver Island, British Columbia.....	do.

BARISSIA Gray.

Barissia GRAY, Cat. Liz. Brit. Mus., 1845, p. 54.—COPE, Proc. Amer. Phil. Soc., XVII, 1877, p. 96.

Identical with *Gerrhonotus* except in the absence of the frontonasal plate.

The species of *Barissia* differ as follows:

- I. No anterior loreal plate (one pair of prefrontonals; dorsal scales larger than ventrals; no supraauricular processes).

Twenty-seven transverse series of scales, which are strongly keeled, especially on the nape; 12-14 longitudinal rows; nasal plate touching rostral, and loreal touching prefrontal; yellowish green with vertical brown bars on sides.

B. rudicollis Wiegmann.

Thirty-forty transverse, 12-14 longitudinal rows of scales, all keeled, the nuchals less prominently; nasal plate separated from rostral, and loreal touching prefrontal; olive brown above, more or less light or dark spotted.

B. imbricatus Wiegmann.

Dorsal scales in 35 transverse and 16 longitudinal rows, eight median keeled; head plates flat; nasal not reaching rostral; loreal touching prefrontal; brown, with lateral vertical brown, white-edged bars.....

Dorsal scales in 46 transverse and 16 longitudinal rows; the four median distinctly keeled; nasal plate separated from rostral; loreal separated from prefrontal by prefrontonal; tawny olive, with vertical brown, white-edged bars on sides

B. levicollis Stejneger.

- II. An anterior loreal plate, 2 pairs of prefrontonals.

α. Dorsal scales larger than ventrals. Elongate supraauricular processes; nasal separated from rostral; scales in 30 transverse and 14 longitudinal series, obtusely keeled; greenish gray above with angular, brown cross bands; below yellow

B. fimbriata Cope.

αα. Ventral scales equal dorsals. No elongate supraauricular processes; nasal plate separated from rostral; scales in 50 transverse and 14 longitudinal rows, only the median obtusely keeled; bronze green, sides with black vertical bars; belly and sides with yellow spots

B. antauges Cope.

The distribution of these species is as follows:

MEDICOLUMBIAN REGION.

SONORAN SUBREGION.

B. imbricata; *B. levicollis*.

TOLTECAN SUBREGION.

B. imbricata; *B. rudicollis*; *B. planifrons*; *B. antaues*.

CENTRAL AMERICAN REGION.

GUATEMALAN PLATEAU.

B. fimbriata.

The species of this genus are of plain colors, excepting those of Section II, which are ornamental in their tints. The *B. fimbriata* of the Guatemalan plateau has the same elongate supraauricular processes as the *Gerrhonotus auritus* of the same district.

BARISSIA IMBRICATA Wiegmann.

Barissia imbricata GRAY, Ann. Nat. Hist., I, 1838, p. 390; Cat. Liz. Brit. Mus., 1845, p. 55; Zool. Beechey's Voy., Rept., p. 96, pl. XXXI, fig. 1.—COPE, Proc. Amer. Phil. Soc., XVII, 1857, p. 97.

Gerrhonotus imbricatus WIEGMANN, Isis, 1828, p. 381; Herpet. Mex., 1834, p. 34, pl. x, figs. 2, 5.—DUMÉRIL and BIBRON, Erp. Gén., V, 1839, p. 407.—DUGÈS, Natureza, 1888, p. 121, pl. XII, fig. 9a; 1893, p. 294, pl. XII.—GÜNTHER, Biol. C. Am. Rept., 1893, p. 38.—BOCOURT, Miss. Sci. Mex., 1879, p. 363.—BOULENGER, Cat. Liz. Brit. Mus., II, 1855, p. 272.

Gerrhonotus lichenigerus WAGLER, Descrip. et Icon. Amph., 1834, pl. XXXIV, fig. 2.—WIEGMANN, Herp. Mex., 1834, p. 35, pl. x, fig. 6.—DUMÉRIL and BIBRON, Erp. Gén., V, 1839, p. 408.

Gerrhonotus olivaceus BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 225; U. S. Mexican Bound. Survey, II, Reptiles, 1859, p. 11.

Head shields swollen. Ear aperture bordered in front by two or three small scales and behind with granular ones. Nasal separated from the rostral. Four prefrontonasal and two internasals. A single nasoloreal. No loreal. Dorsal scales imbricated and strongly keeled, a little larger than the ventral plates. Lateral fold strong. Tail medium length. Body with or without brown transverse bands in the male; two narrow longitudinal yellow lines on the back of the female.

Head-plates separated by strong grooves, causing inequality of the surface. Length from end of muzzle to middle of ear equal to ten transverse series of dorsal scales, and entering four and one-half times into the space between the chin and anus. The muzzle supports two internasals, relatively well developed, situated to the right and left above the nasal, and two large prefrontonasals, which are convex and longer than wide, and truncate posteriorly. These plates are followed by two prefrontals which are angulate posteriorly, and which form a longitudinal furrow, where they meet, along the median line on top of the muzzle. Frontal flat and with the posterior angle truncated; the interparietal also flat, and with the frontal depressed so that the surround-

ing scales are prominent. The occipital scute is in contact with seven obtusely keeled scales; in front with the parietal and the two interparietals, on each side with an accessory occipital, and behind with two roof-shaped nuchal scales. Each of the subocular regions contains seven plates of unequal dimensions, with four superciliary plates on the exterior border. Nostril pierced in the medioposterior part of the nasal plate, which is in contact in front with the internasal, and above with the superior postnasal; posteriorly with the inferior postnasal, and below with the two first supralabials. A large loreal scute which is wider above than below, and articulates in front with the postnasals, above with one of the prefrontonasals, with a prefrontal and with a supraocular; behind with the preocular, and on the basal side, which is narrow, with a part of the fourth supralabial. The preocular, much smaller than the loreal, is irregularly quadrilateral; is followed by two or three subocular scutes, the last one of which is generally very long. Ten supralabials; the first seven subquadrilateral, the two following pentagonal, and the last one, well developed as to length, terminates in a point. Cheek scales angular and flat. Ear-aperture triangular, bordered in front with two or three small convex scales, and behind with scaly grains. The postgenial scute is sometimes simple, but more frequently it is divided and followed by four pairs of large submaxillary plates; the first pair of these only are in contact on their inner sides; the other are separated on their external borders from the inferior labials by a row of scales. Lateral fold strong, having scaly grains similar to those on the sides of the neck; it begins beneath the ear and ends at the side of the cloaca.

Dorsal scales large and subrhomboidal; they form twelve to fourteen longitudinal series, and thirty-five to thirty-seven transverse ones from the auditory aperture to the posterior border of the thighs; in the dorsal region they are strongly keeled, and more or less prolonged to a point, and the keels united form six prominent lines. On the flanks these scales are smooth or slightly rounded; the first transverse series on the neck is composed of eight scales roughly keeled. The ventral plates are shorter, forming twelve longitudinal rows. Tail rounded quadrangular at base, rounded the rest of its length, very tapering at the end, and much longer than the head and trunk combined; it is encircled, when complete, by one hundred whorls of keeled scales, the keels forming prominent lines. Anus bordered with four scutella. Scales of the upper part of the anterior limbs larger than those on the under side; the reverse is found on the posterior limbs; toes covered above and below with well-developed scutella; claws short and hooked. Total length of a type specimen with perfect tail, according to Deppe, 177 mm.; from chin to anus, 87 mm.; tail, 90 mm.

Measurements.—Total length, 330 mm.; length of head from end of muzzle to the middle of ear, 26 mm.; width of head at the borders of the temples, 18 mm.; length of body from chin to anus, 120 mm.;

length of tail, 210 mm.; length of arm to the end of the middle finger, 29 mm.; length of leg to the end of the longest toe, 35 mm.

The two type specimens sent to M. Bocourt by Professor Peters are olivaceous above and greenish gray on the sides; they present no trace of transverse or longitudinal bands. Head dotted with yellowish white points, which cut the posterior or lateral edges of the scales. This light color is also seen on the lips and on the subocular region. Lower surfaces pale yellow, shaded to a greenish tint on the throat and on the sides of the belly.

Professor Dugès¹ gives the following color variations of this species:

The typical coloration is brown above and yellow below, with the skin of the lateral fold pale greenish. Varying from this type, the lateral region above the fold becomes striped with brown-green or drab, a lighter band above a darker one. The color of the fold may be cross-banded with darker, and the dorsal region marked with transverse or rounded brown spots on a greenish on yellowish ground. Or the dorsal region may be uniform brown with pale blue spots, each with a dark blue center, and the fold band be blue spotted. The last pattern indicates the var. *lichenigerus* (*G. lichenigerus* Wiegmann). According to Dugès there may be either one or two loreals.

Dugès says that this species is less vivacious and irascible than the *G. liocephalus*, but that when it bites, it does so with much force. It is readily domesticated; then comes to take its food from the fingers. It eats all kinds of living insects, and swallows them by movements of the throat muscles like those made by snakes. "I have seen it," he says, "eat full-grown Scelopori of the species *S. scalaris* and *S. grammicus*, occupying about ten minutes in the operation. The country people believe them to be poisonous, an opinion which it is unnecessary to contradict; but I know from repeated experiences that when they bite they draw blood, and they do not easily let go."

Dugès further remarks that in the valley of Mexico the *Barissia imbricata* is found about the acequias, but in the State of Guanajuato it only occurs in the mountains, where the winter is tolerably severe. It is also found in the Orizaban district, as Mr. W. S. Blatchley² states that he found it at an elevation of 11,000 feet on Mount Orizaba, and I have three specimens from Lacuatipan, Hidalgo from Dr. Santiago Bernard. According to Dugès it is also found in Michoacan.

Barissia imbricata Wiegmann.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
7036	1	-----	-----	Alcoholic.
7086	1	-----	-----	do.
8317	1	Between Mexico and Chi- huahua.	J. Potts	do.
3096	1	Between El Paso and San Diego.	-----	do.
7087	3	Orizaba	F. Sumichrast	do.

¹ Naturaleza, Mexico, 1893, p. 294.

² Proc. U. S. Nat. Mus., 1893, p. 41.

BARISSIA LEVICOLLIS Stejneger.*Barrissia levicollis* STEJNEGER, Proc. U. S. Nat. Mus., XIII, 1890, p. 184.

The following is Dr. Stejneger's description of this species:

No azygos prefrontal; three pairs of shields between the frontal and the rostral; prefrontals not in contact with loreal; no projecting scales above the ear; one large upper postorbital and two minute lower ones; forty-six transverse rows of dorsal scales between the head and the base of the tail, and sixteen longitudinal rows; head shields swollen. Head narrow, snout long, pointed; head shields swollen; two pairs of internasals, the posterior in contact with anterior supraocular; one pair of prefrontals; nasal separated from rostral; a supranasal; a postnasal; a loreal, pentagonal, not higher than wide, and separated from prefrontals; a preorbital; two suborbitals, the posterior very long; one very large upper postorbital and two minute lower ones; ten and twelve supralabials; sides of neck covered with granular scales; lateral fold, commencing below the ear opening; nuchal scales not keeled, in ten longitudinal rows; dorsal scales of medium size, in sixteen longitudinal rows,

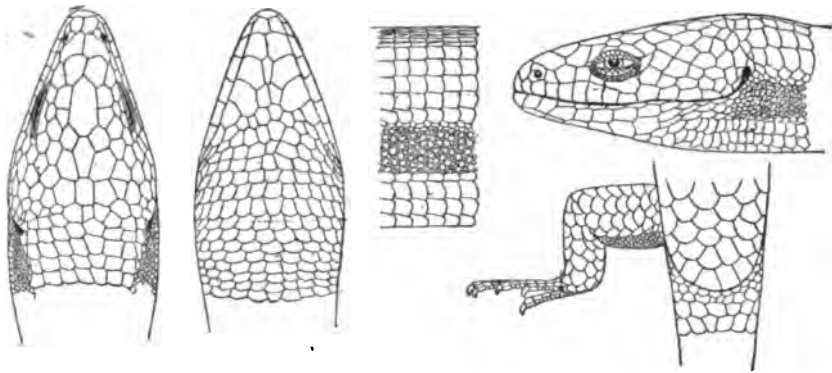


Fig. 96.

BARISSIA LEVICOLLIS STEJNEGER.

=1.

Cat. No. 9632, U.S.N.M.

the four median obtusely keeled, the next two on each side with the keels still less pronounced and the remainder smooth; forty-six transverse dorsal rows; ventrals smaller than dorsals, in twelve longitudinal rows; [tail reproduced].

Color (in alcohol) above uniform "tawny-olive" with interrupted transverse bands of black dots on the sides, the scales with the dots being margined posteriorly, more or less distinctly, with whitish; under side dull pale clay-color, with irregular black dots on flanks and throat.

Measurements.—From snout to vent, 121 mm.; from snout to ear opening, 27 mm.; from snout to fore limb, 38 mm.; from axilla to groin, 67 mm.; greatest width of head, 18 mm.; fore limb, 27 mm.; hind limb, 34 mm.

Unfortunately, the exact locality where the type of this species was collected is not known; all that the record book contains is "Mexican Boundary." It was evidently obtained by one of the surveying parties of the United States and Mexican Boundary, but the original number

having become obliterated, it was reentered in 1877 and the original label—or what remained of it—destroyed.

The present species belongs to the same group as the foregoing, having “three pairs of shields between the frontal and the rostral,” or in other words, “two pairs of internasal scuta.” It differs from *B. imbricata*, however, in the greater number of dorsal rows, both longitudinal and transverse; in the obsolete carination of the dorsal scales; in the exclusion of the loreal from the prefrontals; in the smaller size and greater number of the temporals, and in the narrower and more elongated shape of the head. It has the sixteen longitudinal rows of dorsals in common with *B. planifrons* Bocourt, but the head shields are swollen and the other characters which separate it from *B. imbricata* also distinguish it from *B. planifrons*. *B. rudicollis* is still farther removed by the low number of the transverse dorsal rows, the strong carination of the nuchal shields, and the contact of the nasal with the rostral.

A *Barissia olivacea* was described by Baird in 1858¹ as North American, but Stejneger shows that the locality is uncertain, and that it is the *B. imbricata* Wiegmann of Mexico.

BARISSIA ANTAUGES Cope.

Barrissia antauges COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 132; Proc. Amer. Phil. Soc., 1877, XVII, p. 96.

Gerrhonotus viridiflavus BOCOURT, Ann. Sc. Nat., XVII, 1873, art. 2.

Gerrhonotus bocourti PETERS, Monatsber. Berl. Ac., 1876, p. 297.

Gerrhonotus antauges BOCOURT, Miss. Sci. Mex., Rept., 1878, p. 346, pl. XXI, fig. 4, pl. XXI B, fig. 7.—GÜNTHER, Biol. C. Amer. Rept., 1893, p. 37.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 277.

Dorsal scales very obtusely keeled or smooth; lateral scales smooth. Lateral fold conspicuous. Nasal separated from the rostral. Frontal preceded by two plates, as is the case in most of the species. Six internasorostrals. No supranasals or loreals. Genial entire. Loreal ocular in contact with the sublabials. Tympanum encircled by small convex scales. Tail of medium length. Upper surface of body a greenish brown. Sides numerously streaked with black. Lower surfaces dark green spotted with yellow.

Head relatively short, wide behind, arched above, and covered with smooth scales; length from the end of the muzzle to the ear, equal to twelve or thirteen transverse series of dorsal scales and entering four and one-half times into the space between the chin and arms. Supranasals small, separated in my specimen by a small azygous plate, which is not present in Bocourt's specimens. There are two pairs of prefrontonasals on the top of the muzzle; the first pair are small, and in the specimen sent to M. Bocourt by Professor Peters, these two scales are abnormally spaced from each other, and from their position could easily

¹Proc. Acad. Nat. Sci. Phila., 1858, p. 255.

be mistaken for the supranasals, which are still smaller. Those of the third pair are more developed, are almost of the dimensions of the prefrontals in Bocourt's specimen, but smaller in mine. The latter are pentagonal and articulate with the anterior angle of the frontal. The frontal is larger behind than before, equal in length to the distance from its anterior extremity to the end of the muzzle. The interparietal large and elongate-hexagonal, in contact with the abbreviated point of the preceding scale, and with the two frontoparietals; on each side with a parietal, and behind with the occipital, which in turn borders on the right and left with a postparietal larger than itself. Next to the occipital are two rows of very small nuchal scales similar to those on the neck. Each supraocular region has five or six large plates, which embrace two or three smaller ones externally, which are bordered exteriorly by five superciliary plates. Nostril opening wide, situated in the posterior part of the nasal, which is subrectangular; this plate is in contact anteriorly with the supranasal scute, and above with that of the first prefrontonasal; below with the two first supralabials and behind with the two superposed nasoloreals; loreal either single or double, a larger above a smaller. The loreals are followed by one large hexagonal preocular; next come three suboculars, the latter well developed as to length. There are ten supralabial plates; the first seven are quadrilateral; of these the third, the fourth, and the fifth are the highest; the eighth and ninth are pentagonal, and the tenth ends in an acute angle; four pairs of inferior labials; the cheek scales are smooth, imbricated, and polygonal. The ear aperture is triangular and surrounded by granular scutella. Genial undivided and is followed, on the right and left, by three large, smooth, submaxillary plates; those of the first pair are in contact with each other on the internal side, and all are separated on the opposite side from the inferior labials by a row of scales.

Lateral fold beginning under the eye and ending at the side of the cloaca; the scales on the side of the neck are granular. The cervical and dorsal scales are subrhomboid and of medium size; they constitute fourteen longitudinal series and fifteen transverse from the nape of the neck to the posterior border of the thighs; those of the vertebral region are obtusely keeled or smooth, while those on the sides are smooth. Ventral plates of very nearly the same dimensions, subquadrilateral, with a bowed posterior border, forming twelve longitudinal and forty-two transverse rows from the level of the arm to the anus, which is bordered by four scutella. Tail with fifty-seven whorls of scales, upper caudal scales more strongly keeled than those of the dorsals. Limbs short; the anterior ones covered above with flat scales and underneath with granular ones. The toes are protected above and below by a series of scaly plates; the claws are short and curved.

Measurements.—Total length of a specimen, with the tail, 149 mm.; length of head from the end of the muzzle to the middle of the ear,

15 mm.; length of head to the borders of the temples, 10 mm.; length of body from chin to anus, 69 mm.; length of tail, 80 mm.; length of arm to the end of the middle finger, 15 mm.; length of leg to the end of the longest toe, 21 mm.

Upper part of body is bronze green; head spotted with black on top; three black longitudinal bands on the back, of which the middle one is the widest and extends to the middle of the tail (these bands may be represented by series of brown spots); flanks and sides of neck with vertical black bars or a black network inclosing greenish-white dots; a streak of the same color on each side of the head on a black ground color; this line begins at the nostril, passes beneath the eye, crosses the cheek, and fades out on the side of the neck in the midst of spots of the same color, or it may be wanting on the cheek; lower surfaces dark green, with numerous small, angular, yellowish-white spots. The specimen sent to M. Bocourt by Professor Peters has the breast light green, with numerous greenish-black spots, some of which are as large as those on the belly and tail.

Concerning this species, M. Bocourt remarks: "*G. antauges* closely resembles *G. (Mesaspis) moreletii* in the shape of the head and the coloration of the upper surfaces. It differs from the two other species here described, in the presence of an anterior dorsal plate, agreeing in this respect with the *G. jimbriata*."

Barissia antauges Cope.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
1	Orizaba, Mexico.....	F. Sumichrast.....	Alcoholic.

XENOSAURIDÆ.

Xenosauridæ COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 322.

Trachydermi aglyphodonta BOCOURT, part, Miss. Sci. Mex., Rept., 1878, p. 303.

Xenosauridæ BOULENGER, Ann. Mag. Nat. Hist. (5), XIV, 1884; Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 250.

Boulenger's description is as follows:

Tongue short, villous, with a narrow feebly incised, retractile anterior part covered with flat papillæ. Dentition strictly pleurodont; teeth numerous, small, with long cylindrical shafts, the laterals with obtusely bi- or tricuspid crowns; the new teeth originate between the bases of the old ones. Palate toothless. Postorbital and frontosquamosal arches bony; supratemporal fossa not roofed over by bone; premaxillary, frontal, and parietal single; nasals distinct; palatines and pterygoids widely separated medially, both bordering the infraorbital fossa; a supraorbital bone. Limbs well developed. Clavicle slender, not dilated proximally; interclavicle T-shaped; sternum without fontanelle.

The unique genus, of which the preceding description is given, constitutes a connecting link between the Iguanidæ and the Anguidæ. Its affinity to the former is shown by the T-shaped clavicle, the absence of symmetrical bony shields on the

head, and of osteodermal plates on the body; to the latter by the structure of the tongue, the teeth not hollowed out at the base, and the widely separated palatine bones.

In *Xenosaurus* the alimentary canal presents nothing exceptional. There is no distinct colon, and hence no cæcum. The liver is elongate as in other *Diploglossa*, and the gall bladder is proximad to the margin, and is just visible from below. The corpora adiposa do not project freely into the body cavity. The kidneys are large. The mesenteries are of the normal type.

The hemipenis of *Xenosaurus* is quite peculiar. There are no calyculi or flounces. There is a prominent fold with pectinate edge on each side of the sulcus spermaticus, which incloses a pyriform area. This is divided in the middle by a longitudinal fold, which represents the welt opposite the sulcus of various other genera, and its distal end terminates in a free papilla. From the apex there depend two large divergent club-shaped papillæ, which have a series of points along the adjacent sides. There is a small papilla at the base between them. The arrangement has a remote resemblance to that seen in the *Chamæleon pardalis*, and is unlike anything found in the other *Diploglossa*.

The following are the characters of the only known genus:

No abdominal ribs. Head covered with small tubercular scales, which coalesce with the skull. Eyelids well developed. Tympanum covered with scales. Body depressed, covered above with granular scales intermixed with tubercles, inferiorly with cross rows of squarish juxtaposed scales; no bony plates. Digits well developed, with sharp, curved claws. No femoral pores. Tail round.. *Xenosaurus* Peters.

But one species of this genus is known, the *Xenosaurus grandis* Gray, a rather small Mexican lizard. The genus *Exostinus* Cope from the White River bed of Colorado resembles this one, so far as known, and may enter the same family.

LEPTOGLOSSA.

Leptoglossa GRAY, Cat. Liz. Brit. Mus., 1845, p. 3.

Leptoglossa and *Typhlopthalmi* COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 227, 228; Bull. U. S. Nat. Mus., No. 32, 1887, p. 25.

Lacertoides GILL, Report Smithsonian Inst. for 1885, 1886, p. 800.

Superior plate of petrous bone produced anterior to the anterior semi-circular canal. Clavicles proximally dilated, usually perforated. Interclavicle cruciform (with exceptions in degenerate forms). Frontal bone not underarching olfactory lobes. Postorbital and supratemporal arches present. Surface of tongue squamous or plicate, not papillose. Hemipenis never calyculate.

In addition to the above definitive characters, the following are general, but with actual or possible exceptions. Surangular and angular bones distinct from each other.

Meckel's cartilage inclosed. Premaxillary not bounded behind by a foramen on each side of the inferior plate.

As regards the visceral anatomy, it may be said that the corpus

adiposum is present and free, except in certain Scincidæ, where it is wanting. The urinary bladder is present, except in Teiidæ, where it is wanting.

A colon is rarely present, and the alimentary canal is not very elongate. The liver has usually but one or two notches behind, but there are modifications to be mentioned under the heads of the respective families. It is not elongate, except in serpentiform types. The ventral mesentery extends as far as the liver, and sometimes a short distance beyond. The transverse or cystic mesentery is present.

The families differ as follows:

I. Surangular bone distinct (mostly lacertiform).

α. One premaxillary bone.

β. No urinary bladder.

Parietal bones coossified; temporal fossa not roofed with bone; no osteodermal plates 15. TEIIDÆ.

ββ. A urinary bladder.

Parietal bones distinct; temporal fossæ with a bony roof; no osteodermal plates 16. XANTUSIIDÆ.

Parietals united; temporal fossæ overroofed; no osteodermal plates 17. LACERTIDÆ.

Parietals united; temporal fossæ roofed; osteodermal plates.

18. GERRHOSAURIDÆ.

αα. Two premaxillary bones.

Parietals united; temporal fossæ roofed; osteodermal plates. . 19. SCINCIDÆ.

II. Surangular bone not distinct (serpentiform).

Two premaxillary bones; occipital segment closely united with parietal; columella and arches present; eye distinct. 20. ACOTIIDÆ.

Two premaxillary bones; no columella; no arches; eyes concealed by integument 21. DIBAMIDÆ.

One premaxillary bone; occipital segment loosely attached; columella present; no arches; eye concealed by the integument 22. ANELYTROPIDÆ.

Of these families the Xantusiidæ and Teiidæ are confined to the New World and the Lacertidæ and Gerrhosauridæ to the Old World. The Scincidæ are cosmopolitan, abounding most in the warmer parts of the South.

XANTUSIIDÆ.

Xantusiidæ BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 254.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885.

Lacertidæ COPE, part, Proc. Acad. Nat. Sci. Phila., 1864, p. 229.

Trachydermi aglyphodonta BOCOURT, part, Miss. Sci. Mex., Rept., 1878.

Lepidophymiens SUMICHRIST, Bull. Soc. Zool. France, 1880, p. 178.

Xantusiidæ COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 30.

Xantusiidæ BOULENGER, Ann. and Mag. Nat. Hist. (5), XIV, 1884, p. 120.

Lepidophymidæ GÜNTHER, Biol. Cent.-Amer., Rept., 1885.

Tongue short, scarcely extensible, indistinctly nicked anteriorly, with oblique overlapping plicæ converging toward the median line, and scale-like imbricate papillæ on the distal extremity. Dentition strictly pleurodont. Postorbital and supratemporal arches bony, strong, the supratemporal fossa roofed over by the cranial bones; premaxillary single; nasals, frontals, and parietals two; palatines in contact with each other anteriorly and with the maxillary and ectopterygoid, there being no

Each of these genera includes but one species, excepting *Xantusia*, which embraces two. All belong to the Pacific and Sonoran districts, except *Lepidophyma*, which occurs in the Central American (Mexican).

In addition to the characters which I have previously given, Mr. Boulenger states¹ that the sternum is without fontanelle. I find the hyoid apparatus has characters somewhat similar to those of the Lacertidæ. The ceratohyals and second ceratobranchials are both present and there is a well developed free epibranchial. Its proximal end overlaps the distal end of the second ceratobranchial. It passes around the extremity of the first ceratobranchial and extends forward. In *Lepidophyma* it has the peculiarity, which I have not seen in any other lizard, of being inserted on the lateral process of the basioccipital. In *Xantusia riversiana* it terminates before reaching this point. In *Lepidophyma* it displays a concave expansion as it passes the extremity of the first ceratobranchial, in which lies the helicoid cartilaginous extremity of the latter. In neither genus are the hypohyals prolonged with the ceratohyals, as in Anguidæ, nor beyond them as in the Teiidæ.

The stapelial disk in *Lepidophyma* is not sunk in a canal, as in the Iguanidæ and some other Sauria. The columella is slender, and terminates in the interstapelial cartilage. This supports an oblique cartilaginous rod, one end of which (suprastapelial) is attached to the osseous wall above, and the other longer one (epistapelial) is in contact by a flat surface of its extremity with the membrum tympani.

The remarkable characters of the skull in *Xantusia* are described under the head of that genus. Bocourt² represents a probably similar structure in *Lepidophyma*.

Xantusia and *Lepidophyma* agree in their visceral characters. The corpus adiposum is small and projects freely into the abdominal cavity. The alimentary canal is distinguished into stomach, small intestines, and rectum only, the latter elongate. The posterior border of the liver has a small middle lobe; right lobe moderately produced. Lungs equal. Mesenteries normal.

The contents of the stomach of a *Xantusia riversiana* include vegetable remains, and fragments of hymenopterous and coleopterous insects, showing a mixed diet.

XANTUSIA Baird.

Xantusia BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 255.—COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 29; American Naturalist, 1895, p. 758.—BOULENGER, Cat. Liz. Brit. Mus., 1885, II, p. 327.

Body cylindric, without crests or spines. Tail cylindric, moderate. Head covered with large polygonal plates; superciliary scales segmental; belly with square plates in transverse series. Tail encircled by whorls of quadrate scales. Femoral pores present, pierced in an

¹ Cat. Liz. Brit. Mus., II, 1885, p. 325.

² Mission Scientifique de Mexique, pl. xx G, fig. 2.

undivided scale. Three folds on the throat, the anterior connecting the ears inferiorly and encircling the head. Pupil vertical; no eyelids. Digits 5-5.

Teeth pleurodont, tricuspid; about ten upper maxillary, nine palatine. Roof of mouth extended backward as far as angle of mouth and ending in a W-shaped outline, the central angular notch behind. This is due to dermal flaps extending from the palatine bones, which overlap on the middle line. Tongue thick, fleshy, depressed, and oval, entirely attached behind and by a central band, the terminal two-fifths free, and slightly notched, the base entire. On the basal third of the tongue above are two oblique series of wrinkles converging anteriorly; these soon become finer and closer, the anterior portion being covered with short, compact, depressed, scale-like papillæ.

Osteology.—My knowledge of the osteology of this genus is derived from the *X. riversiana*, specimens of which I owe to my friend, Dr. J. J. Rivers, of Oakland, California.

The premaxillary has an elongate spine above and a nearly transverse posterior border below. Nasals well developed, distinct. Frontal single, grooved below. Parietal single, without pineal foramen, produced posteriorly so as to overhang the occipital bone and foramen magnum, being connected with the former by a median keel, which it sends downward. The supraoccipital is subhorizontal and is not articulated in the usual way with the parietal, having only the median contact above mentioned. It is coossified with the exoccipitals. The prefrontal is small and is not produced far over the orbit. Lachrymal absent. Jugal with the superposterior limb expanded. Postfrontal and postorbital fused into a triangular bone, which bounds the parietal externally, thus, with the supratemporal, roofing over the temporal fossa. Supratemporal in contact throughout with the parietal, except where separated by the narrow splint of a paroccipital. Quadrate with one, a large external couch. Vomers closely juxtaposed throughout, coossified anteriorly, the median portion of the two elements with an excavation. Narial orifices nearly closed, except posteriorly, where the vomerine process of the palatine overarches them. The latter are in contact in front, but soon spread apart. Maxillary processes rather shorter than vomerine, depressed below them. Pterygoids narrow throughout, not wider than palatines, their posterior part with a groove which looks upward and inward. Basipterygoids overlapping their entire internal face. Ectopterygoids wide, reducing the palatine foramen to a mere slit; with a considerable contact with the palatine, and a recurved portion in contact with the extremity of the maxillary; the internal extremity depressed. No presphenoid; sphenoid separated by suture from basioccipital, whose lateral processes are compressed and decurved. The postoptic bone seems to be wanting. The petrosal is well produced beyond the semicircular canal, and is equally produced below the trigeminal foramen, where it joins a backward directed process of the basipterygoid. The groove below it is well defined and looks

downward. The epipterygoid rises at the basipterygoid and rests on the anterior border of the petrosal and the posterior border of the well-marked descending process of the parietal. Fenestra ovalis not sunk in the fundus of a fossa.

The mandible is remarkable in having but three bones. The articular, angular, and surangular are coossified, and the splenial and dentary. The coronoid has little horizontal production on the outside of the ramus, and the angle of the dentary extends considerably posterior to it. The Meckelian groove is entirely closed.

The hyoid apparatus is described under the head of the genus *Xantusia*.

There is no zygosphe. There are six cervical intercentra besides that of the atlas. The cervical ribs begin on the fourth vertebra. Four of these ribs are of peculiar form, being expanded and truncate at the extremity so as to be somewhat fan-shaped. Neural spines rather low on the cervical and caudal regions, and lower on the dorsal vertebræ. Caudal vertebræ segmented toward the anterior part, the fissure passing through the middle of the diapophyses. Neural spine single, oblique, posterior; chevron bones normal.

Suprascapula short and wide; scapula without proscapula. Coracoid with one notch; sternum without fontanelle. Interclavicle with moderate posterior limb. Sternal ribs three; xiphoid rods not juxtaposed, supporting two ribs. No abdominal ribs.

Pubes meeting at about a right angle; pectineal angles near the middle, decurved. Pubis with tuber exterior. Ilium without angulus cristæ; acetabulum entire.

The teeth have compressed tridentate crowns; those of the premaxillary bone are not conic, but have also compressed crowns, where traces of denticles are sometimes apparent.

The remarkable features in the osteology of this genus are (1) the peculiar relations between the parietal and supraoccipital bones, which resemble the structure seen in a sea turtle; (2) the wide ectopterygoid; (3) the absence of lachrymal; (4) the presence of only three mandibular elements. The affinities are a mixture of those of the Lacertidæ and Scincidæ; the large postfrontal bones; the descending processes of the parietals, and the form of the pubes, resembling the corresponding parts in the latter family. The expanded cervical ribs resemble those of the Geckonid genus *Phyllodactylus*. The relations of the parietal and occipital bones are quite different from those found in the Lacertidæ and Anguidæ (*Gerrhonotus*, *Celestus*, *Ophisaurus*), where the temporal fossæ are also roofed over. In these forms the contact is normal, that is, by the elevated median portion of the anterior border of the occipital.

Three species of this genus have come under my observation. They may be distinguished by the following characters:

Small; limbs short, barely overlapping where appressed to the sides. Tail short, equal from vent to angle of mouth; one row of supraocular scales; one parietal on each side. Color, light brown with dark brown speckles..... *X. vigilis* Baird.

Medium; limbs longer, hind limbs appressed, reaching shoulder; tail long, twice body; one row of supraoculars; one parietal, above light brown with two rows of very large pale-edged maroon spots.....*X. picta* Cope.
 Largest; limbs short, hind limb appressed, overlapping forefoot; tail equal body plus head to front of eye; two rows of supraoculars; two parietals on each side; above light brown with black, coarse vermiculations.....*X. ricensiana* Cope.

Neither of the above species has been found thus far outside of the limits of the State of California.

XANTUSIA VIGILIS Baird.

Xantusia vigilis BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 255.—BOULENGER, Cat. Liz. Brit. Mus., II 1885, p. 327.

The hind leg extended twice forward reaches to the first gular fold, and is contained about two and three-fourth times in head and body, the head four and one-half times; the hind foot from heel nearly six times. The claws are all very small; the digits covered beneath by a series of transverse and imbricating plates.

The color above generally is a dull brownish yellow varied with small blackish spots on single tubercles. The young specimens exhibit a yellowish vermiculation on a brown ground distinctly seen on the sides of body, neck, and head. There are two yellowish parallel lines from the supraoculars down the back of the neck becoming finally lost, and between these on the back of the neck are two more, making four yellow lines on the nape. The under parts are whitish.

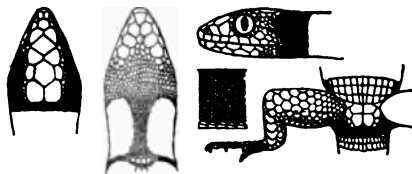


Fig. 97.

XANTUSIA VIGILIS BAIRD.

× 1.

Cat. No. 1926, U.S.N.M.

In this species the head is short and covered above by a small number of very large plates. It is bounded behind by a constriction which borders the posterior extremity of the large occipital plates, passes through the ears, past the end of the lower jaw and across the throat, thus completely separating the neck from the head. The head is short, broad, pyramidal, and quadrangular; the sides nearly vertical; the rostrum rather pointed, its upper outline convex. There is a very large hexagonal interparietal plate (the largest on the head), behind which are two other irregularly pentagonal postparietals side by side, applied against the two posterior faces. The oblique lateral borders are in contact with an elongated pentagonal plate, and the anterior with two adjacent subtriangular parietal plates, the long sides nearly equal. These cover the whole supraorbital space, are in contact behind only with the interparietal and parietal plates, excepting a very small one, postero-externally. The plate which represents the frontal is rhomboidal, broader than long, the lateral corners truncated and in contact with the supraoculars. This, with the frontoparietals, completely

fills the interorbital space, bordered externally by six small square supraoculars. Next comes a pair of prefrontals shaped like the frontoparietals, but only half the size; then a small regularly hexagonal frontonasal, the two anterior faces of which are in contact with a pair of internasals, which connect with the rostral, which is entirely terminal and not at all visible from above. The superior plates form a regular succession of plates in pairs and single, four of the former and three of the latter, or 2, 1, 2, 1, 2, 3, 2, the anterior median being bordered on either side by the postnasal. The rostral plate is low, wide, nearly linear, with eight labials on either side. The nostrils are small, terminal or lateral, and placed over the junction of rostral and labial or in the corners of the rostral, labial, internasal, and nasal (in the antero-inferior corner of the latter). There is a large pentagonal postnasal, higher than broad, articulating above with the frontal and postfrontal. The loreal is large and separated from the orbit by two small plates, the lower subcircular and over the junction of the third and fourth labial. The orbit is completely surrounded by a circle of small plates, of which six are superior, six posterior and inferior, and three or four anterior. There is a large central mental, with seven labials on each side. The labials are bordered internally by five plates, the anterior three much broader than the labials, and filling up the end of the lower jaw, except a median plate connecting the second on either side.

The eyes are large, the pupil elliptical and vertical. A membranous circle, with the edges crimped, seems to represent eyelids. This is however, apparently not protractile and is wanting above.

The auricular openings are vertical, elongated, and directed upward and backward. It has a border anteriorly of six or eight small tubercles, less than those which cover the cheeks anterior to it.

The back and sides are covered with small, close, bead-like tubercles arranged in transverse series. They are rather elongated and alternate in adjacent rows. There are about forty in a series across the back. The chin and throat, to the first fold, are similar but more rounded. The two throat folds are close together, the plates in their interval rounded, but smaller than elsewhere, the space between them covered with four series of square plates increasing successively to the hinder one, which, however, is not as large as those on the breast. The under parts from the hinder fold to the anus are covered with regular square plates in ten longitudinal series, raised to twelve by a lateral more irregular and rather smaller row on each side. These plates do not alternate in successive rows, but form longitudinal series, these twenty-eight transverse series from throat to thighs and three on the pubis of two each increasing progressively in size until those bordering the anus are much larger than on the belly. The tail is encircled by about seventy whorls of scales which lengthen behind; they are composed of square plates, the upper more convex from side to side.

The legs are rather short, covered with tubercles like those on the back except on the upper surface of the humerus and the anterior of the forearm and thigh and under surface of tibia, which are covered with large plates. The femoral pores, nine or ten in number, are not conspicuous. The digits are short; the fourth hind toe not much longer than the third; its free portion only half the head from snout to ear.

In his report on the reptiles of the Death Valley expedition, Dr. Stejneger remarks:

Two additional specimens are now before us, one collected by Dr. Fisher at Hesperia, on the south side of the Mohave Desert, on January 4, 1891, while Mr. Palmer secured the other on February 24, in Pahrump Valley, Nevada, thus extending the range of the species nearly 200 miles eastward. The type locality, Fort Tejon, is in an open cañon—the celebrated Cañada de las Uvas of the early exploring expeditions—connecting the west end of the Mohave Desert with the San Joaquin Valley. The fauna and flora of this cañon present a mixture of Mohave Desert and interior valley forms.

In all probability this species is more or less nocturnal in habits, which may account for the scarcity of specimens collected.

Both specimens are somewhat larger than the largest of the types, and, judging from the condition of the femoral pores, I take them to be adults.

There appears to be some slight variation in the shape of the individual head shields and in the shape of the head, the Death Valley expedition specimens having it somewhat more elongate; but the differences are not greater than between the type specimens themselves.

Mr. J. Van Denburgh¹ states further that—

X. vigilis is the most abundant lizard in the territory it has chosen for its home. It seems to be peculiarly dependent upon the presence of tree yuccas. A glance at Dr. Merriam's map (N. Amer. Fauna, No. 7, map 5, 1893) shows that these weird plants grow in each of the localities from which the species has been recorded, viz: Fort Tejon in the Cañada de las Uvas, and Hesperia, in California, and in the Pahrump Valley in Nevada.

Dr. C. H. Gilbert and the writer collected specimens near Mojave, and found a portion of a cast skin at Victor, California, in November, 1893. In September of the following year the writer found this species common at Mojave and Hesperia, and secured a single specimen near Cabazon on the eastern slope of San Geronio Pass, California. The first three of these localities are situated in the great *Yucca arborescens* belt, which extends along the southwestern edge of the Mojave Desert. The last is in a small and apparently isolated grove of smaller tree yuccas, seemingly of another species.

Habits.—These observations were made in the neighborhood of Mojave, California, November 4, 1893. About a mile from the station there is a considerable forest of *Yucca arborescens*. The many trees and wind-broken branches which lie decaying on the ground afford a home to numerous colonies of white ants, scorpions, vicious-looking black spiders, and several species of beetles. In a deep crack of one of these branches a small lizard was discovered, which, when caught, proved to be a young *Xantusia vigilis*. Probably it had not yet learned how to hide from the day, for I have never seen another undisturbed individual.

The key to their home once discovered, the collection of a large series of these lizards was merely a matter of physical exertion. Every fourth or fifth stem that was examined gave up its *Xantusia*, and, in one instance, as many as were previously known to collections were found under a single tree.

Most of the lizards were found between the bark and the ground, but many had

¹Proc. Cal. Acad. Sci. (2), V, 1895, p. 523.

hidden in the thick clusters of dead leaves, from which it was very difficult to dislodge them. When first exposed to the light, they were dark colored, and seemed dazzled for a moment, during which they made no attempt to escape. They were not at all sluggish, however, and if not caught immediately, made for the nearest cover as fast as their very short legs would permit. This cover was often the collector, and the little lizards either hid under his shoes or climbed his legs, sometimes even reaching his shoulders. They showed no desire to enter the numerous holes in the ground about them, or to escape by burrowing. Put into a glass bottle they became very light colored in a few minutes, but began to turn dark again immediately after sundown. Young specimens were numerous, and remained dark longer than adults. Many fragments of cast skins were found, but never a whole skin in one place. The stomachs of several individuals contained the wings of some small dipterous insect, the elytra of a little brown beetle, and some very small white bodies which resembled spiders' eggs.

Several specimens were taken alive to the Leland Stanford Junior University and kept for some months in a large glass jar in which some fine sand and pieces of wood and bark had been placed. At first they ventured out from their retreat only at dusk unless disturbed, but after a few days they seemed to become more restless, and, urged perhaps by hunger, showed themselves many times each day. At night, when they were always more active, they often climbed to the top of a piece of yucca stem placed upright in the middle of their cage. No desire to burrow was observed. All declined to show any interest in the small beetles and flies, both dead and living, which were placed in the jar, and finally became greatly emaciated. They were chloroformed in March, 1894.

A second note dated Mojave, California, September 17-18, 1894, is as follows:

As it was not practicable to learn by actual investigation whether or not *X. vigilis* hid, during the day, among the thick-growing leaves of the living yuccas, the localities examined in 1893, still clearly marked by the displaced rubbish, were again searched with great care. The fact that very few specimens were now secured in this previously worked area, while the species was very common just outside its limits, is evidence that the specimens found on the ground under the dead branches were in their true diurnal home, and not mere stragglers from the living yuccas.

The specimens were all caught alive and put into a large glass bottle, but were soon killed by the heat, although care was taken to keep them in the shade as much as possible. Count was kept as the lizards were put in the bottle, and showed later that several more were taken out than were put in. This may have been due to a mistake in the record, but was more probably caused by the birth of young after capture. The adults were afterwards carefully examined, and three were found to contain young, showing that the species is ovoviparous. One of the three contained two fetuses; the others have one each. These fetal specimens are about the size of the young found under the dead branches.

Xantusia vigilis Baird.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	
3063	3	Fort Tejon, California		J. Xantus.	
296-9	4	California.		H. H. and C. S. Brinley.	

U. S. N. M. No.	Locality.	Altitude.	When collected.	From whom received.	Remarks.
		Feet.			
18618	Pahrump Valley, Nevada		Feb. 24	Palmer	
18919	Hesperia, Mohave Desert, California	3,200	Jan. 4	Fisher	Pl. III, fig. 1.

XANTUSIA PICTA Cope.

Xantusia picta COPE, American Naturalist, 1895, pp. 859, 939.

As already noted in the analytical table of species of *Xantusia*, this species is of more slender proportions than the two other members of the genus; its limbs and tail are much longer, so that its habitats are probably different from theirs. There are numerous minor differences in the squamation, and the head is much flatter than in either of the other species, as well as somewhat wider. In its coloration it is remarkably different, being much more elegant than the others. Its scutal characters ally it with the *X. vigilis* rather than with the *X. riversiana*.

Head very much flattened and broad behind; body and proximal half of the tail flat, distal half of the latter cylindric. The tail tapers gradually from the base, and is not swollen as in the other species. It is twice the length of the body. Extended hind limb reaching to shoulder: extended fore limb reaching anterior border of orbit. The

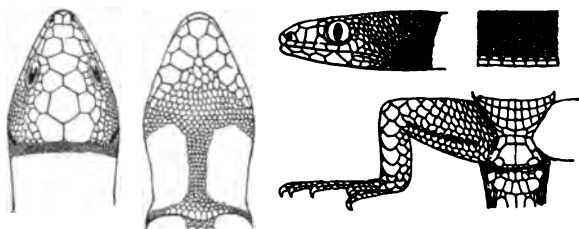


FIG. 98.

XANTUSIA PICTA COPE.

× 3.

Tejon Pass, California.

Collection of E. D. Cope.

digits are not very elongate; the first finger is shorter than the fifth, and the second toe extends farther distad than the fifth, which extends a little beyond the first. Claws well protruded from their sheaths.

The head scuta are a good deal like those of the *X. vigilis*. The internasal is rectangular, and is a little wider than long; the frontonasals are longer than wide and have considerable mutual contact. The frontal is wider than long, as is each of the occipitals. External to the parietals is a series of four or five smaller scuta, of which the first two are in contact with the supraoculars. One nasal, two loreals, the posterior larger than the anterior, and two small preoculars. Eye resting directly on superior labials. There are six of the latter on each side, and a seventh scale is separated from the mouth border by smaller scales. The fifth and sixth bound the orbit. In the *X. vigilis* there are seven and eight scales on the mouth border; the fifth is immediately below the eye, from which it is separated by a series of minute scales. A large symphyseal, and only four inferior labials in contact with the lip border: a fifth separated from it by scales. The third and fourth are

separated by the large third infralabial, which reaches the lip border. I do not remember any other lizard in which this occurs. In *X. vigilis* there are five inferior labials in an uninterrupted series, the fifth separated from the lip border by a scale. Infralabials six on each side, the anterior three larger than the posterior three; the anterior pair in contact on the middle line, the others separate. The auricular meatus is nearly as large as the orbit, and has no processes on its anterior border.

The dorsal and lateral scales are subround, smooth, and in transverse series. They are subequal and measure about 0.33 mm. The abdominal scales are much larger, are subquadrate and in transverse rows. Each row includes fourteen (in the largest sixteen) scales. In *X. vigilis* there are twelve and fourteen. Femoral pores ten (six and seven in *X. vigilis*). Ten large scales in the gular collar. Preanals in three series; two narrow series of four scales each in front, and a pair of very large scales behind, each bounded by a much smaller scale at the posterior outer angle. Scales of limbs rather uniform, larger on the external surfaces, largest on the anterior and inferior faces, where they nearly equal those of the belly, but have rounded borders.

Measurements.—Total length (tail complete), 124 mm.; length to vent, 50 mm.; total length to axilla, 23 mm.; total length to collar, 18 mm.; total length to *meatus auditorius*, 11 mm. Length of fore leg from axilla, 17 mm.; of fore foot, 6.5 mm. Length of hind leg from groin, 25 mm.; of hind foot, 10 mm.

Ground color, light pinkish-gray. This is overlaid by two dorsolateral rows of large purplish-brown spots which are only separated by narrow lines of the ground. The tail is marked by two similar rows of smaller and more widely separated spots. Hind limbs closely, fore limbs sparsely spotted. Head plates purplish-brown, with pale borders. Inferior surfaces uniform yellowish.

I have seen but one specimen of this species. It was sent me by Dr. J. H. Rivers, of the University of California, to whom I am also under obligations for the first specimens of the species next to be described. Dr. Rivers states that the former specimen was taken at Tejon Pass, in southern California.

XANTUSIA RIVERSIANA Cope.

Xantusia riversiana COPE, American Naturalist, 1879, p. 801; Proc. Acad. Nat. Sci. Phila., 1883, p. 29.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 328.—RIVERS, American Naturalist, 1889, p. 1100.

The scales of the dorsal and lateral regions are rather coarsely and uniformly granular. The abdominal scales are quadrate, and are in sixteen longitudinal and thirty-two transverse rows. The preanal scales are in three transverse rows, the anterior two of four scales, with the median pair in both much enlarged, and the posterior row of six scales. Scales of the gular region flat and hexagonal, one row on the gular fold a little larger, and equal to the anterior gulars. Scales

of the anterior aspects of the fore leg and femur larger than the others; those of the tibia small, and those of the posterior face of the femur still smaller. Scales of the tail in whorls of equal width. The scales of equal size and all convex in cross section, but not keeled. None of the scales of the body or limbs keeled.

The nostril is situated in a small scute at the junction of the sutures which separate the internasal, rostral, first labial, and first loreal scuta.

Three loreals, increasing in size posteriorly. A circle of scales surrounds the eye, of which the superior, or superciliary, are the largest. The latter are separated by one row of scales from the parietal, frontoparietal, and frontal on each side. The fronto-nasal is nearly square. The internasals are considerably in contact. The frontal is hexagonal, and is broader than long. The interparietal is as large as each parietal. It is longer than wide, and notches the contact of the frontoparietals. The occipitals are large and quadrate. A single large temporal bounds the parietals and occipital, and it is followed by two small scuta, which are in contact with the occipital. A triangular plate intervenes between the occipital and parietal. There are eight scales on the upper lip. Of these the

fifth is the largest, and is part of an annulus which begins with two small scales at the posterior loreal and terminates at the seventh scale, opposite the middle of the pupil posteriorly. The posterior labials are small and are separated by nine rows of still smaller scales from the large temporal. No large auricular scales. The eye is rather large, and its diameter is contained in the length of muzzle in front of it 1.75 times. The vertical diameter of the auricular meatus is a little less.

The first digits of both extremities are very short. The second of

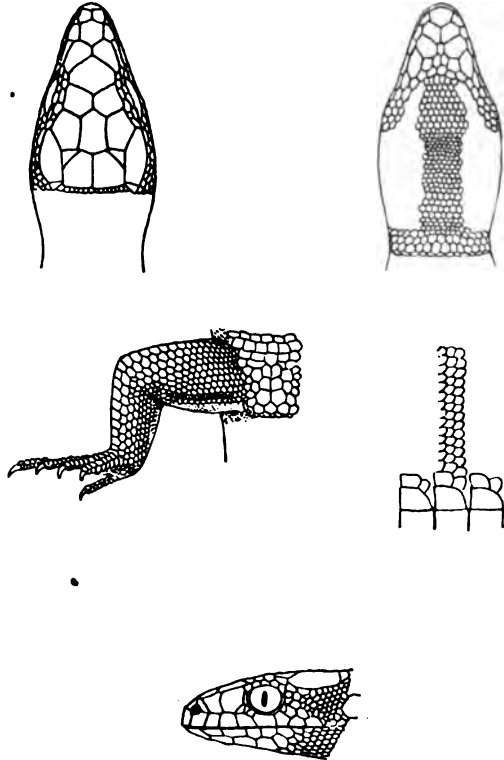


Fig. 99.

XANTUSIA RIVERSIANA COPE.

× ½.

Santa Catalina Island, California.

From type in Museum, University of California.

the pes is very little longer than the fifth. All the ungues are acute and are moderately curved. The hind legs are remarkably short, not exceeding the fore legs. Extended forwards the extremity of the fourth digit reaches the elbow of the appressed fore leg. Femoral pores twelve on each side; no anal pores. The tail is not long, and its form is compressed, with a flat inferior surface. The section is a triangle, higher than wide, with the apex narrowly truncate.

The color is light-brown, with dark umber-brown spots on the superior surface. These spots form, in general, one median and two lateral rows, but as their forms are very irregular this order is obscure. The median dorsals are the largest, and they send branches laterally and anteroposteriorly, so that the result is rather confused. Dark-brown bands cross the muzzle on the frontonasal plates and on the frontal, and form a wide U from the frontoparietals passing around the posterior edge of the occipitals. Sides of head with rather large brown spots. Inferior surfaces with minute brown spots, which are least numerous on the middle line. Tail with irregular pale spots.

Measurements.—Total length, 118 mm.; length to posterior edge of occipital plates, 16.2 mm.; length to axilla, 29 mm.; length to groin, 55 mm.; length to vent, 60 mm.; width between orbits above, 7 mm.; width at temples, 11.5 mm.; length of forelimb, 17 mm.; length of manus, 8 mm.; length of hind limb, 23 mm.; length of pes, 11 mm.; length of tibia, 7 mm.

The species which has given occasion for the above discussion is several times as large as the type *X. vigilis* Baird, and has a different coloration. The digits are shorter. The typical specimen was found by Dr. J. G. Cooper, zoologist of the State Geological Survey of California, and was placed in the collections of the University of California, where I saw it. It was kindly lent me for examination by the authorities of the university. The locality from which the specimen was obtained is San Nicolas Island, one of the Santa Barbara group, coast of California. Subsequently, three specimens were obtained from San Clemente Island, California, by the naturalists of the *Albatross*.

The latter display some differences from the typical specimen, as well as among themselves. They all have the temporal plate transversely divided, two into three plates and one into two, the anterior the largest. In the two smaller specimens the occipitals are divided into two equal parts by an oblique suture. In the largest specimen one occipital is undivided, as in the type, and the other is about half divided anteriorly by an incomplete groove. The character of the two rows of supraorbital scales is present in all. The largest specimen is double the size of the largest of the *X. vigilis* known. Without the tail, which is injured, the length is 85 mm.; length to axilla, 38 mm.; to *meatus auditorius*, 19 mm.

Three specimens from the Santa Barbara Islands were subsequently sent me by Dr. Rivers. In all of them the temporals are divided, gen-

erally into three scuta, of which the anterior is the larger. The total length of one of them (tail perfect) is 167 mm. The head plates become, in the adults, somewhat corrugated.

Xantusia riversiana Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
15166	1	San Clemente Island, California.	C. S. Townsend, U. S. S. <i>Albatross</i> .	In alcohol
15172	1	Coast of California	do	do.
15174	1	do	do	do.
21554	3	San Clemente Island, California.	do	do.
16321	1	do	J. G. Cooper	do.
16322	1	Santa Barbara Islands, California.	do	do.
16323	1	California	do	do.

ZABLEPSIS Cope.

Zablepsis COPE, American Naturalist, 1895, p. 758.

Pupil erect. The pairs of scuta on the muzzle, the middle pair being the divided frontonasals. Frontal undivided; superciliaries present. Frontoparietals in contact on the middle-line; the occipitals separated by an interoccipital.

The scuta of *Xantusiidae*, like those of many of the *Leptogloss* families, are a definite quantity, and very characteristic. I have hence proposed to separate this form generically from *Xantusia*, since it differs in the division of the frontonasal and the presence of an interoccipital. The latter plate is only found on this genus in the *Xantusiidae*.

But one species is known, and it inhabits southern California.

ZABLEPSIS HENSHAVII Stejneger.

Zablepsis henshavi COPE, Amer. Naturalist, August, 1895, p. 758.

Xantusia henshawi STEJNEGER, Proc. U. S. Nat. Mus., XVI, p. 467.

Dr. Stejneger's brief description of this species is as follows:

Like *Xantusia vigilis* it has but one series of superciliaries (or supraoculars), while *X. riversiana* has two. It is longer and slenderer than the latter, and is more depressed than either. The color differs from both in being blackish-brown on the upper surface irregularly marbled with cream-colored lines which on the tail incline toward forming cross bands; under side whitish; scales on back small, uniform, flat tubercles; ventral scales in fourteen longitudinal and thirty-three transverse rows, preanal scales in three transverse rows, the two median posterior scales being the largest; about ten femoral pores on each side. Total length, 148 mm.; length to posterior edge of occipital plates, 13 mm.; length to vent, 65 mm.

Direct comparison of the type specimens shows that this species is quite nearly allied to the *Xantusia picta*. It resembles it in the proportions of the tail and in the flattened head and body. There are a good many coincidences in the details of structure, as in the size of the dorsal and ventral scales, and in the number of femoral pores. The color-

ation alone would not distinguish the two as species, although strikingly different. The differences are, however, important. First, the generic characters of two internasals, and an interoccipital plate. Second, the hind limb is materially shorter, since when extended it only reaches the elbow of the forelimb. Third, the third infralabial is not so large, and does not reach the labial border. There are five inferior labials reaching that margin instead of four. The third (last) pair of preanal plates is not so disproportionately large. As points of minor importance may be added the presence of two wide scales between the second pair of infralabials instead of one; and the fact that the dark color of the superior surfaces appears on the sides of the throat and abdomen, and on the inferior side of the tail, which it does not in the *X. picta*.

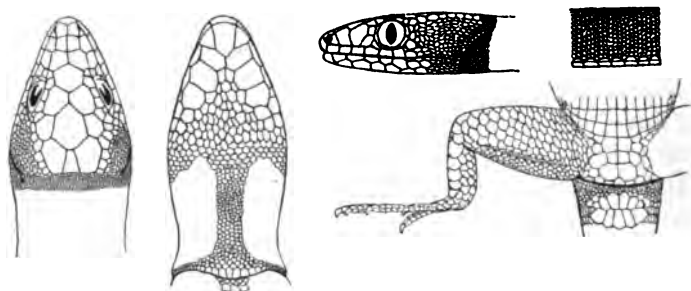


Fig. 100.

ZABLEPSIS HENSHAWII STEJNEGER.

× 4.

California.

Cat. No. 20339, U.S.N.M.

Concerning this species Mr. J. Van Denburgh remarks that at Witch Creek, San Diego County, California, it lives among the numerous granite boulders, and comes out into the narrower crevices between them a few minutes before dark. It is, therefore, practicable to hunt for it only about fifteen or twenty minutes each day. If a bit of string or a straw be introduced into the domain of one of these lizards it will often be seized, the reptile apparently mistaking it for an insect.¹

Habitat.—Witch Creek, San Diego County, California.

Type.—Cat. No. 20339, U.S.N.M.; H. W. Henshaw collection; May, 1893.

AMŒBOPSIS Cope.

Amæbopsis COPE, American Naturalist, August, 1895, p. 758.

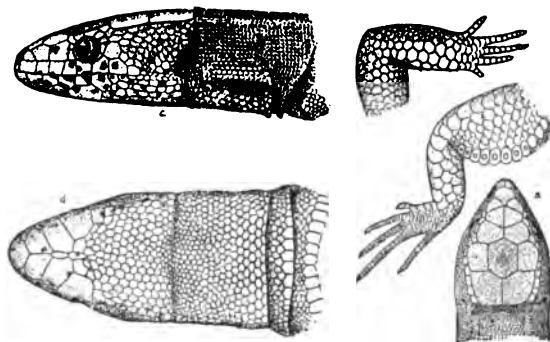
A single frontonasal; frontal longitudinally divided. Frontoparietals in contact; no interoccipital plate. Superciliaries present. Pupil erect.

This genus includes a single species which has been taken in Lower California.

¹Proc. Cal. Acad. Sci. (2), V, Pt. 1, 1895.

AMCEBOPSIS GILBERTII Van Denburgh.*Amcebopsis gilbertii* COPE, Amer. Naturalist, 1895, p. 758.*Xantusia gilbertii* VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, p. 121, pl. xi.

I only know this interesting species from the description and figure given by Mr. Van Denburgh, which I here transcribe. The eye is very small, without lids, and with vertical pupil. The nostrils are pierced at the junction of the rostral, internasal, first superior labial, and first loreal plates. There are 3 loreals, increasing in size posteriorly. There are 2 internasals. The 2 frontonasals are separated by the interfrontonasal, which is in contact also with the 2 frontal plates. The other head plates are 2 frontoparietals, 2 parietals, 2 large occipitals, and 1 interparietal. The eye is surrounded by a ring of small scales,

**Fig. 101.****AMCEBOPSIS GILBERTII** VAN DENBURGH.

× 2.5.

Lower California.

From Van Denburgh.

of which the superciliaries are largest. This ring is separated from the third loreal by 2 small scales. There are 8 superior and 8 inferior labials. The anterior border of the ear is slightly denticulate. The ventral plates are arranged in 32 transverse and 10 or 12 longitudinal series. The caudal scales are smooth, convex, and in whorls of about equal length. The back and sides are covered with smooth convex granules of about uniform size. There are 8 and 9 femoral pores. The gular regions are covered with smooth, flattened, subhexagonal granules, which are slightly larger than those on the back and sides.

The color above is dark brownish clay dotted with black on single granules. A pale yellowish line, two granules wide, runs posteriorly from each occipital plate, but is soon lost on the back to reappear over the thigh.

Measurements.—Length to vent (about), 39 mm.; tail (about), 38 mm.; hind limb, 14 mm.; fore limb, 10 mm.; diameter of eye, 1 + mm.;

shielded part of head, $8\frac{1}{2}$ mm.; head to posterior edge of ear, $8\frac{1}{2}$ mm.; head to anterior gular fold, $7\frac{1}{4}$ mm.; head to posterior edge of anterior fold, $11\frac{1}{4}$ mm.; head to posterior edge of posterior fold, $12\frac{3}{4}$ mm.

The single specimen of *X. gilbertii* has been compared with 144 of *X. vigilis* without any approach to any of its distinctive characters having been found. It is of great interest, for it extends the known range of the genus *Xantusia* several hundred miles to the southward, introducing it for the first time into Mexican territory, and affording another link between the "Cape region" and the Sonoran subprovince.

Type.—Cat. No. 401, Cal. Acad. Sci.; San Francisquito, Sierra Laguna, Lower California; Gustav. Eisen, March 28, 1892.

TEIIDÆ.

Lacertiens, *Scincoidiens* CUVIER, part, Règne Anim., II, 1817, pp. 24, 61.

Tupinambidæ, *Chalcididæ* GRAY, part, Ann. Phil. (2), X, 1825, pp. 199, 204.

Cordyloidea, *Tachydromoidæ*, *Chalcidoidea*, *Ameiroidæ* FITZINGER, part, Neue Classif. Rept., 1826, p. 11.

Teiidæ GRAY, Phil. Mag. (2), II, 1827, p. 55.

Autarchoglossæ acrodonia and *pleurodonia* WAGLER, part, Syst. Amph., 1830, pp. 153, 154.

Ameivæ, *Lacertæ*, *Chamaesauri*, *Ptychopleuri*, *Gymnophthalmi* WIEGMANN, part, Herpt. Mex., 1834, pp. 8, 9, 11.

Lacertiens pléodontes, *Chalcidiens*, *Scincoidiens* DUMÉRIL and BIBRON, part, Erp. Gén., V, 1839, pp. 68, 318, 511.

Teidæ, *Chalcidæ*, *Anadiadæ*, *Chirocolidæ*, *Cercosauridæ*, *Gymnophthalmidæ* GRAY, part, Cat. Liz., 1845, pp. 3, 4.

Argaliadæ GRAY, Ann. Mag. Nat. Hist., XVIII, 1846, p. 67.

Ecpleopoda TSCHUDI, Arch. f. Nat., 1847, p. 41.

Riamidæ GRAY, Proc. Zool. Soc., 1858, p. 445.

Cercosauri PETERS, Abh. Berl. Acad., 1862, p. 169.

Teidæ, *Chalcididæ*, *Ecpleopidæ* COPE, Proc. Acad. Nat. Sci. Phila., 1864, pp. 228, 229.

Teidæ, *Chalcididæ* COPE, Proc. Amer. Assoc. Adv. Sci., XIX, 1871, p. 237.

Teiidæ BOULENGER, Ann. Mag. Nat. Hist. (5), XIV, 1884, p. 120.

The following description, with slight modifications, is from Boulenger:

The tongue is flat, more or less elongate, ending in two long smooth points, the greater part of its surface covered with rhomboidal, imbricate scale-like papillæ; in *Alopoglossa*, these scale-like papillæ are replaced by oblique plicæ, as in *Xantusiidæ* and the Lacertoid genus *Tachydromus*. In a few genera the tongue is particularly long and narrow at the base, which is retractile into a sheath; in the others the tongue is bicuspid posteriorly; the whole organ, when the distal points are close together, being arrow-headed.

The teeth vary considerably, but are constantly to be distinguished from those of the analogous family Lacertidæ in not being hollow at the base, the new teeth developing in small sockets at the base of the old ones. In some of the higher forms (*Tupinambis*, *Dracaena*, *Teius*), the lateral teeth are inserted almost on the parapet of the jaws, so that, in fact, they might be termed *acrodont*; this dentition is, like that of the "pleurodont" *Amphisbænoids*, truly intermediate between the *acrodont* and *pleurodont*. In the other forms the teeth are attached more distinctly to the inner side of the jaws and there is a basal shaft. The premaxillary teeth are constantly conical; the laterals may be conical, bicuspid, tricuspid, obtuse, or molar-like (adult *Tupinambis*), or enormous oval crushers (*Dracaena*); the bicuspid teeth

may be either compressed longitudinally, or perpendicularly to the jaws (*Dicrodon, Telus*). Pterygoid teeth are but seldom present, and if so, but feebly developed.

In the most highly developed forms the skull presents the typical Lacertilian or Cionocranian structure; but as we approach the Chalcidinae forms the skull becomes more depressed, the vacuity between the ante and postorbital portions and consequently the interorbital septum become much reduced, the arches weaker, and at last we have in *Ophiognomon* a skull where the pterygoids are largely in contact with the sphenoid, the arches are very weak, the columella is so reduced as to be hardly distinguishable, and the whole skull forms an almost continuous solid mass.

The premaxillary bone is single, the nasals double, the frontal and parietal single; a small supraorbital bone exists in some *Ameivas*; the palatines are in contact anteriorly; the maxillary is excluded from the infraorbital fossa, which is bounded by the palatine, pterygoid, and transverse bone, as in *Varanus*. The headshields are always free from the cranial ossification, a character which separates sharply this family from the Old-World Lacertidæ.

Limbs or their rudiments are present; the degradation begins with *Proctoporus*, which has very short limbs, but with five well-developed clawed digits; the limbs are still more reduced in size in *Scolecocaurus*, and the digital formula is incomplete, although claws are still present; in *Cophias* and *Ophiognomon* digits are either entirely lost or reduced to bud-like rudiments; and in *Propus* the pelvic limbs have altogether disappeared. The clavicle is dilated and perforated proximally; however, Cope mentions *Tretioscincus* and *Scolecocaurus* as forming exceptions, having a simple clavicle; the interclavicle is cruciform.

I have already noted a peculiarity in the visceral anatomy of this family, in the absence of the urinary bladder. This structure is alleged by such authors as Stannius to be present in all Sauria. I have found no trace of it in the genera *Tupinambis*, *Dracæna*, *Ameiva*, *Cnemidophorus*, *Centropyx*, *Gymnophthalmus*, and *Callopistes*. In all these genera the kidneys have a peculiar form, being expanded transversely for the anterior half of their length, and then tapering posteriorly to a point. In this respect they differ from any family of lizards known to me.

The alimentary canal presents the usual three parts, stomach, small intestine, and rectum, with terminal rectal cloaca. There is no especially distinguished colon except in *Callopistes*. In *Dracæna* a portion of the canal immediately succeeding the stomach is constricted off from the small intestine for a moderate distance. In *Callopistes* there is a short wide colon without cæcum. The liver is not elongate, and has only one posterior notch. Recurved lobe of the right lobe inconspicuous or wanting. The ventral mesentery extends beyond the liver to a part of the small intestine.

The mesenteric attachments of the liver are very characteristic in the Teiidæ. There is but one suspensor, a median gastrohepatic, but this bifurcates above the middle of the organ and each half diverges, and adhering to the caudal margin, extends to the lateral inferior body wall on each side. In *Tupinambis* these sheets are united on the median line for a distance posterior to the liver. The lungs are each attached to the stomach by a separate sheet. The left hepato-parietal sheet is always present in this family, but the right one is feeble in some genera and is easily ruptured, as, for instance, in *Cnemidophorus*. I have

examined the genera *Dracæna*, *Tupinambis*, *Callopiastes*, *Ameiva*, *Onemidophorus*, *Centropyx*, *Tejus*, *Anadia*, and *Oreosaurus*.

I have examined the anatomy of *Propus* Cope, the most degraded and serpentiform type of the family, in order to ascertain whether it exhibits any affinity to the Annulati, as supposed by Boulenger, and to which it has a strong external resemblance. As the anterior limbs only are present, and these are without digits, this genus is even less lacertiform than the Annulate *Bipes*, so far as external appearance is concerned.

Propus has very slender postorbital and supratemporal arches, and the paroccipital bone is represented by a relatively rather large nodule between the quadrate, the exoccipital and the supramastoid process of the parietal. The last-named process is rather short and, like the rest of the parietal, is closely applied to the occipital, slightly overlapping the latter. The epipterygoid is present, and is in contact with the strongly decurved angular lateral margin of the parietal and the anterior border of the superior plate of the petrosal. The trigeminal notch is as usual in lizards, and the cranial wall anterior to the petrosal is membranous. The stapes is very large and its columella is a mere tuberosity.

Scapular and pelvic arches present; anterior limbs only, and these minute.

Scapular arch.—All the elements present, but the sternum represented by a narrow longitudinal cartilage, and the interclavicle without lateral processes. Clavicle osseous, distally simple; suprascapula cartilaginous; scapula and coracoid osseous. Coracoid deeply twice emarginate, the emarginations occupied by the coracoid cartilage. Sternum with two costal articulations. Fore limbs consisting of humerus and rudimental ulno-radius.

Pelvic arch.—This consists of a simple slender costiform bone, directed downwards and forwards from the diapophysis of a single vertebra. It is homologous wholly or in part with the ilium.

The lungs are in the position normal to lizards, posterior to (above) the alimentary canal.¹ The left is very much shorter than the right, and though bound to the latter by connective tissues is not fused with it except at the proximal extremity, and it has no separate bronchus. The small intestine is only moderately complex, and there is a short but conspicuous cæcum at its entrance into the large intestine. The liver begins well posterior to the heart, is slender, and has a very small left lobe, and a long and narrow right lobe. The gall-bladder has the usual position between the two. Kidneys elongate, posterior, symmetrical.

The above characters show that there is not as much resemblance to the Annulati in the serpentiform Teiidae, as there is in the Annielloidea, which see.

Two or three types may be observed in the structure of the hemipenis,

¹ This is also the case in the allied genus *Anisoclonium*, where the digits are 4-1.

but I have not had access to sufficient material to enable me to refer all the genera to the one or the other. In the typical members, as the genera *Dracæna*, *Tupinambis*, *Ameiva*, *Cnemidophorus*, and *Centropyx*, the pattern consists of numerous delicate, imbricate, transverse laminae, which are closely applied to each other. Opposite the sulcus all the genera display a welt, which has free borders. These are entire in *Dracæna*, and pectinate in *Ameiva* and *Cnemidophorus*. Between these and the borders of the sulcus is a rounded welt on each side. The laminae are at first sublongitudinal, diverging proximad from sulcus; on the first welt they turn sharply distad; between this and the welt they make a second chevron, turning proximad. Proximad of the medium welt these laminae meet, forming a curve or chevron turned proximad. In *Cnemidophorus* there is one less chevron. In this genus and *Ameiva* there is a strong fleshy papilla at the apex of each tract between the welt and sulcus.

A modification is seen in *Centropyx* (*pelviceps*). Here there is a narrow welt opposite the sulcus. On each side of the sulcus a prominent welt diverges from it proximad and approaches the proximal end of the median welt, so as to inclose a space with it. It is transversely plicate, and the inclosed space on each side the median welt has the delicate transverse lamination characteristic of the Teiidae. What is entirely peculiar is the presence at the apex of each of the laminate spaces of a large patch of acute flexible papillae.

The plan is the same in the *Anadia bogotensis*, but the details are quite different. The organ is bifurcate. A strong welt opposite the sulcus is divided into five longitudinal folds, which are crimped transversely. The space between this and the sulcus is marked with folds which diverge distad from the welt and become longitudinal, and are transversely crimped. In the longitudinal direction of the plicae this genus differs from true Teiidae, and it is likely that *Ecpleopus* and other allied genera are similar.

In a third type represented by *Heteroclonium bicolor* a welt bounds the sulcus on each side. The space between these is marked by a few feeble cross folds, and the borders support a single series of closely placed recurved spines. Genera allied to *Cophias* are likely to present this structure.

According to Boulenger—

The Teiidae comprise a large number of species, all of which are inhabitants of the New World, which show great variety of form and scaling. The Teiidae with Lacertoid and Varanoid appearance pass, through *Crocodylus* and *Neusticurus*, into the Cercosaurs (to which the latter is nearer on account of its separated nasal plates, although placed hitherto with the true Teioids). We have, then, several diverging series, the two principal being: Toward *Heterodactylus* through *Arthrosaura*, and toward *Cophias* through *Proctoporus*. On the other hand, *Cophias* resembles *Heterodactylus* in the position of the nostril, and the latter genus leads us through *Perodactylus* to the skink-like genera, such as *Iphisa* and *Gymnophthalmus*, which all agree with *Heterodactylus* in the rudimentary condition (or absence) of the inner finger.

The genera differ as follows: The system adopted is a modification of that of Boulenger, but is as yet in a very tentative stage.

- I. Anterior nasal plates not separated by the fronto-nasal; limbs well developed;
- A. Scaly portion of the tongue not much widened, and not or but feebly emarginate posteriorly, frequently retractile into a basal sheath.
1. Ventral plates small, forming more than 20 longitudinal series.
Tail not or but feebly compressed; dorsal scales uniform, small.
Tupinambis Daudin.
Tail strongly compressed, with a double longitudinal keel above; dorsal scales intermixed with large keeled tubercles.
Dracæna Daudin.
 2. Ventral plates large, forming less than 20 longitudinal series.
Ventral plates keeled; femoral pores..... *Centropyx* Spix.
Ventral plates keeled; no pores..... *Monoplocus* Günther.
Ventral plates smooth; no femoral pores..... *Tejaporus* Cope.
Ventral plates smooth; pores..... *Ameiva* Cuvier.
- AA. Scaly portion of the tongue arrowheaded, bifid, and not retractile posteriorly.
1. Tail rounded.
 - a. Teeth longitudinally compressed.
Head shields large, regular; ventral shields in less than 20 longitudinal rows..... *Cnemidophorus* Wagler.
Like *Cnemidophorus*, but frontoparietal plates fused together.
Verticaria Cope.
Head-shields small, numerous; ventral shields in more than 20 longitudinal rows..... *Callopterus* Gravenhorst.
 - aa. Teeth transversely compressed.
Toes five..... *Dicrædon* Duméril and Bibron.
Toes four..... *Teius* Merrem.
 2. Tail strongly compressed, bicarinate. Dorsal scales small, uniform.
Crocodilurus Spix.
- II. Nasal plates widely separated by one or two frontonasals; fingers and toes five, all clawed.
- A. Præfrontals present.
1. Tail compressed, with a double denticulated crest.
Dorsal lepidosis composed of small scales intermixed with large keeled ones..... *Neusticurus* Duméril and Bibron.
 2. Tail round or cyclo-tetragonal.
 - a. Lingual papillæ, oblique plicæ.
Dorsal scales large, pointed, strongly keeled; ventrals imbricate; collar obscure..... *Alopoglossus* Boulenger.
Ventrals truncate; collar well defined; dorsals in transverse rows.
Ptychoglossus Boulenger.
 - aa. Lingual papillæ normal, scale-like.
 - α Dorsal scales irregular and of different sizes.
Posterior head scales small; gular scales irregular, no collar nor femoral pores..... *Echinosauro* Boulenger.
 - α Dorsal scales strongly keeled.
 - * Dorsal scales arranged in regular transverse and oblique series.
† Claws well developed, curved.
Ventrals like the dorsals, keeled..... *Leposoma* Spix.
Ventrals quadrate, smooth; no collar.. *Loxopholis* Cope.
Ventrals quadrate, smooth; a collar.
Pantodaetylus Duméril and Bibron.
 - †† Claws small, straight, conic.
Ventrals like dorsals, keeled; no collar; femoral pores present..... *Alionyx* Cope.

- * * Dorsal scales forming transverse series only.
Lateral scales like dorsals *Arthrosaura* Boulenger.
Lateral scales small, irregular.

Prionodactylus O'Shaughnessy.

- * * * Dorsal scales forming regular transverse and longitudinal series *Cercosaura* Wagler.

β Dorsal scales smooth or feebly keeled.

- * Dorsal scales not larger than ventrals.

Scales not forming uninterrupted series round the body; a continuous series of femoral and præanal pores.

Placosoma Tschudi.

Scales subequal, forming uninterrupted series round the body *Anadia* Gray.

Scales not forming uninterrupted annuli, the laterals being much smaller; dorsals hexagonal; collar-fold feeble; males without femoral pores.

Ecpleopus Duméril and Bibron.

Scales not forming uninterrupted annuli, the laterals being much smaller; collar-fold strong; males with femoral pores *Euspondylus* Tschudi.

- * * Dorsal scales larger than ventrals.

Scales quadrangular, smooth; collar-fold strong; both sexes with femoral pores *Argalia* Gray.

AA. No præfrontals.

Dorsal scales hexagonal, striated, imbricate; collar-fold feeble.

Pholidobolus Peters.

Dorsal scales keeled, juxtaposed, separated from ventrals by a wide zone of small scales; collar-fold strong *Oreosaurus* Peters.

Dorsal scales smooth or striated, juxtaposed, separated from ventrals by a fold; collar-fold strong *Proctoporus* Tschudi.

III. Nostril pierced between the nasal and the first labial; no ear opening (except *Stenolepis*).

A. Digits rudimentary or absent.

- * Fronto-nasal and prefrontal plates present.

Digits clawed distinct, 4-4 *Scolecossaurus* Boulenger.

- ** Fronto-nasal present; no prefrontals.

α Claws present.

Digits 4-2 *Sesquipes* Cope.

Digits 4-1 *Anisocolonium* Cope.

Digits 3-3 *Microdactylus* Gray.

Digits 3-2 *Herpetochalcis* Boettger.

$\alpha\alpha$ Claws absent.

Digits 3-1 *Cophias* Fitzinger.

- *** Fronto-nasals, prefrontals, and claws wanting.

Digits 3-1 *Ophiognomon* Cope.

Fore limbs undivided; hind limbs absent *Propus* Cope.

AA. Digits well developed; inner finger rudimentary. (Lower eyelid with transparent disc.)

Dorsal scales narrow; hexagonal-lanceolate, keeled; no meatus auditorius.

Heterodactylus Spix.

Scales similar; a meatus auditorius and fronto-parietal plates; inner finger developed *Stenolepis* Boulenger.

IV. Nasal plates widely separated by a fronto-nasal; ear exposed; inner finger, if distinct, clawless.

A. Eyelids developed.

Dorsal scales narrow, hexagonal-lanceolate, keeled. *Perodactylus* Reinhardt and Lütken.

All the scales rounded, imbricate, two median dorsal and two ventral series strongly enlarged transversely..... *Iphisa* Gray.

All the scales rounded, imbricate, subequal..... *Tretioscincus* Cope.

AA. No eyelids; scales cycloid, quincuncial.

No præfrontals; fronto-parietals present; digits 4-5. *Microblepharus* Boettger.

Præfrontals present; no fronto-parietals; digits 4-5. *Gymnophthalmus* Merrem.

The accompanying table gives the geographic distribution of the genera of the Teiidae. From this the wide distribution of the genus *Cnemidophorus*, and the almost equally wide distribution of the genus *Ameiva*, may be learned. The poverty of the Nearectic Realm is also apparent, while the richness of the Brazilian and Colombian regions is exhibited. The distribution of some of the genera entered in these lists is not sufficiently well known to make their place clear. While some genera are found in both regions, there is some doubt about others which appear in both lists, and which have been found in the mountainous regions of the Andes. It is probable that there is a special zoological district in these elevated regions, but whether it is a branch of the Colombian or Brazilian district, or distinct from both, is not now determinable. Some of the Colombian forms range into Panama and Costa Rica.

Nearctic.				Neotropical.			
Eastern.	Central.	Pacific.	Sonoran.	Central American.	West Indian.	Colombian.	Brazilian.
<i>Cnemidophorus</i> .	<i>Cnemidophorus</i> .	<i>Cnemidophorus</i> . Verticaria	<i>Cnemidophorus</i> Verticaria	<i>Cnemidophorus</i> . <i>Ameiva</i> . Verticaria	 <i>Ameiva</i> ... Tejaporus	<i>Cnemidophorus</i> . <i>Ameiva</i> ... Verticaria Callopistes. Loxopholis. Leposoma.. Gymnophthalmus. Otilian. Callopistes	<i>Cnemidophorus</i> . <i>Ameiva</i> . Tupinambia. Iracena. Crocodilurus. Centropyx. Telus. Neusticurus. Alopoglossus. Mionyx. Leposoma. Panodactylus. Gymnophthalmus. Arthrosaura. Prionodactylus. Cercosaura. Placosoma. Ecpleopus. Euspondylus. Oreosaurus. Proctoporus. Argalia.... Sesquipes... Boaclonium. Cophias..... Propus. Heterodactylus. Colobosaura. Iphisa. Microblephorus.

VERTICARIA Cope.

Verticaria COPE, Proc. Amer. Phil. Soc., 1869, p. 158.

Scaly portion of tongue cordate behind, not retractile. Tail rounded. Teeth compressed in the line of the jaws. Head shields large, regular; ventrals large; frontoparietal plates fused together; superciliaries segmental. A collar fold. Femoral pores present in a rosette of scales.

This genus only differs from *Cnemidophorus* in the confluent frontoparietal scuta. Four species are known; the *V. heterolepis* Tschudi, from the Pacific region of Peru; the *V. hedracantha* Bocourt, from Mexico; and the *V. hyperythra* Cope, and *V. sericea* Van Denburgh, from Lower California. The last-named species are defined as follows:

Small; brachial plates numerous, large, continuous with antebrachials. Collar margined with large scales; body scales minute; four supraorbitals. Olive, sides black, with two yellow stripes; two dorsal stripes; belly red. *V. hyperythra*.
Larger; collar margined with small scales; hind leg longer; five light stripes; belly blue *V. sericea*.

VERTICARIA HYPERYTHRA Cope.

Verticaria hyperythra COPE, Proc. Amer. Phil. Soc., 1869, p. 158; Bull. U. S. Nat. Mus., No. 32, 1887, p. 45.

Cnemidophorus hyperythrus COPE, Proc. Acad. Nat. Sci. Phila., 1863, p. 103.—BOULENGER, Cat. Liz. Brit. Mus., 1885, II, p. 371.

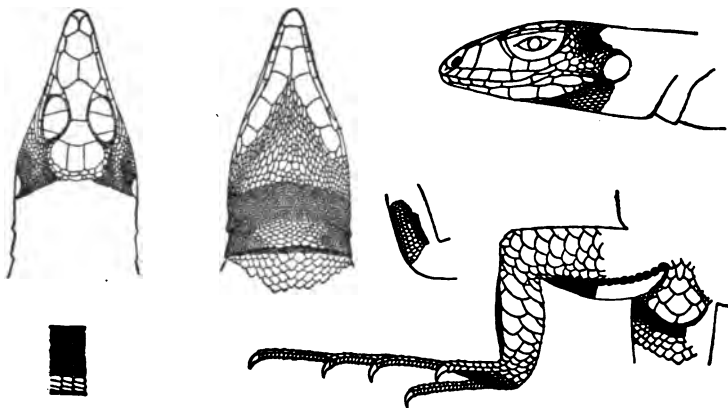


Fig. 102.

VERTICARIA HYPERYTHRA COPE.

× $\frac{1}{2}$.

Cerro Island, Lower California.

Cat. No. 11980, U.S.N.M.

External nares in the nasal plate. Brachium with four series of plates, three on the antebrachium, the superior largest. Head rather narrow, muzzle long. Hind foot two-fifths the length of the head and body. Three rows of scales on the gular fold, the anterior row median,

short; scales of the posterior largest. Posterior gular scales small, abruptly separated from the anterior, which are large, the median twice the size of those surrounding. Supraocular plates four, rarely three. Abdominals in eight series; sometimes additional small external plates. Frontoparietals united, truncate in front, shorter than interparietal. Three larger anals; two posterior, one anterior. Body scales minute.

Above, light brown or olivaceous; two yellow bands on each side, which extend some distance on the tail, one from the superciliary margin, one from inferior border of orbit; the last bordered with blackish beneath and extending on the posterior extremity to the foot; the caudal portion continued from a similar band on the poster or face of the limb. A paler dorsal band on each side. Interspaces between the lateral stripes black. Beneath, iridescent rose color, deeper posteriorly, becoming brownish vermilion on the under surface of the tail. In young specimens the upper light stripe on the back from the parietal plate more distinct.

A species allied to the *Onemidophorus deppii* Wiegmann in scutellation; the latter has two frontoparietals, three supraoculars, is stouter and more numerously banded.

This species is found throughout the entire peninsula of Lower California, and north as far as San Diego, California.

Verticaria hyperythra Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
5299	12	Cape St. Lucas, Lower California.	.....	J. Xantus	Alcoholic
12613	16	La Paz, Lower California.	Feb. —, 1882	L. Belding	do.
12658	2	do	Feb. —, 1882	do	do.
11980	6	Cerro Island	Feb. —, 1882	do	do.
13840	1	San Diego, California .....	.....	C. R. Orcutt	do.

VERTICARIA SERICEA Van Denburgh.

Verticaria sericea VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, p. 132, pl. XII.

The nostrils are in the large anterior nasal plates, which meet on top on the snout. The posterior nasal forms sutures with the anterior nasal, first and second labials, loreal, prefrontal, and frontonasal plates. The loreal is in contact with the second, third, and fourth labials, first subocular, preocular, first superciliary, first supraocular, prefrontal, and posterior nasal. There are three supraoculars, the first is in contact with the first and second superciliaries, loreal, prefrontal, frontal, and second supraocular; the second is in contact with the frontal; the third is separated from the frontal and the frontoparietal by a series of granules. The interparietal is very narrow. There is a series of occipital plates. There are five superior and six inferior labials to below the middle of the eye. The ear opening is not denticulated. The sublabials are separated from the infralabials by granules. The anterior

gulars are rather large and abruptly separated from the small posterior gulars. The scales on the collar are very small, largest centrally, smaller on edge. The ventral plates are arranged in eight longitudinal and thirty transverse rows. The back is covered with small, equal-sized granules. The conical tail is provided with scales arranged in whorls. The upper caudals have strong diagonal keels, but the lower are smooth. There are sixteen femoral pores. The hind limb is longer than the distance between the arms and the line of separation of the anterior and posterior gulars.

The back is clove brown, dotted with gray on single granules posteriorly, with a median bluish-white line which bifurcates on the neck about a fourth of an inch behind the occipital plates. There are two similar lines on each side; the first originating on the superciliaries

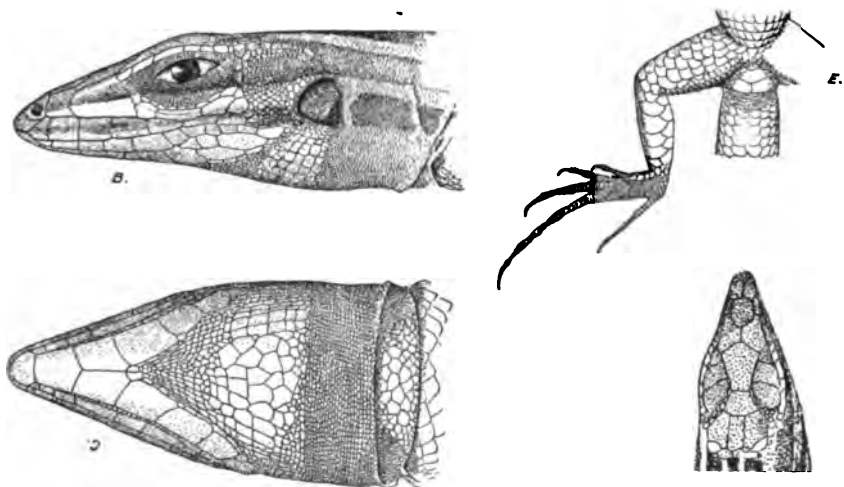


Fig. 108.
VERTICARIA SERICEA VAN DENBURGH.
= 1.

From Van Denburgh.

and with a faint continuation on the tail; the second starting at the nostril and ending on the thigh. The ground color of the sides is much paler than in *V. hyperythra*, being pale sepia. The general tint of the tail is hair brown above, pale blue below. The ventral and sublabial plates, the chin, gular region, and collar are all pale blue.

Measurements.—Length to anus, 54 mm.; hind limb, 44 mm.; fore limb, 22 mm.; head to ear, 13 mm.; anus to gular fold, 36 mm.; anus to anterior gular, 42 mm.; width of head, 8 mm.

The single specimen of *Verticaria sericea* has been compared with ninety-eight of *Verticaria hyperythra* and thirty-eight of *Verticaria hyperythra beldingii*, without any approach to its distinctive characters having been found.

Type.—Cat. No. 435, Cal. Acad. Sci.; San José Island, Gulf of California; Walter E. Bryant, April, 1892.

CNEMIDOPHORUS Wagler.

Cnemidophorus WAGLER, part, Syst. Amph., 1830, p. 154.—WIEGMANN, Herpt. Mex., 1834, p. 9.—DUMÉRIL and BIBRON, Erp. Gén., V, 1839, p. 123.—GRAY, Cat. Liz., 1845, p. 20.—BOCOURT, Miss. Sci. Mex., Rept., 1874, p. 269.—BOULENGER, Cat. Liz., II, 1885, p. 360.

Ameira FITZINGER, Neue Class. Rept., 1826, p. 21.

Verticaria COPE, Proc. Amer. Phil. Soc., XI, 1869, p. 158.

Scaly portion of tongue cordate behind and not retractile. Tail rounded. Teeth longitudinally compressed. Head shields large, regular; ventrals large; parietals and frontoparietals distinct; superciliaries segmental. A collar fold. Femoral pores present, in the center of a rosette of scales.

This genus embraces many species of the Neotropical realm, exclusive of the West Indian region, where it is replaced by *Ameiva*. Five species enter the Nearctic realm, and all but one of these are restricted to the Sonoran region. This one, *C. sexlineatus* Linnæus, ranges the entire Nearctic, excepting the Hudsonian and Alleghenian districts, and the northern parts of the Central and Californian.

Osteology.—For characters of the skeleton I have three individuals of the *C. tessellatus* from my own, and one of the *C. sexlineatus* from the national collection. The alveolar portion of the premaxillary is prominent, and is marked off from that of the maxillary bone by a shallow emargination on each side. The superior spine is long, and the palatal border is deeply emarginate to receive the narrow anterior production of the vomers. The nasals are distinct and rather elongate, although encroached on in front by the enlarged nostrils. The frontal is single and is rather narrow. The parietal is without pineal foramen in the adult. The parietoquadrate arch is well elevated, and is braced below by the small paroccipital. The supraoccipital is in close contact with the parietal by its middle portion, and it is distinct from the exoccipital by suture. The prefrontal does not extend above the orbit; the lachrymal is smaller, but rather large, and forms a suture with the jugal. The postfrontal is wanting, being fused with the postorbital. The latter is produced downward and has a longer suture with the supratemporal than with the narrow jugal. The quadrate has an external conch only. The vomers are elongate and are in contact throughout, but each is swollen on the middle line so that they are divided by a groove along their common suture. The narial fissure is long and narrow, and is contracted anteriorly, and then enlarged foramen-like at the anterior extremity. The vomerine branch of the palatines is longer than the maxillary branch; the pterygoid branch is not very wide, and the palatine foramen is of moderate size. The ectopterygoid is rather wide and has an anterior suture with the palatine bone as well as with the maxillary; it is deflected posteriorly. Pterygoid moderately expanded anteriorly and contracting gradually; the posterior portion but slightly grooved, and attached to the basipterygoid process by its

entire width, and not by the groove only. Presphenoid rudimental; sphenoid distinguished from basioccipital by suture; the latter with descending compressed lateral processes. Petrosal with a short presemicircular process, and a long subforaminal process; the latter presenting an open groove downward. Inferior face of frontal grooved. postoptic not reaching frontal, triradiate, the two superior limbs shorter than the inferior. Epipterygoid arising opposite ectopterygoid and in contact with a descending lateral process of the parietal and not touching petrosal.

The hyoid apparatus is distinguished, like that of other Teiidae, by the great prolongation of the hypohyals anterior to the point of attachment of the ceratohyals. No second ceratobranchials or free epibranchials.

In the mandible the Meckelian groove is closed except at the distal portion. The coronoid is produced far anteriorly and not at all posteriorly on the external face, and the dentary does not extend much beyond the tooth line. Surangular distinct; angle horizontal, expanded, and forming an angle inwards. A distinct masseteric fossa, bounded below by the angular. Splenial elongate, extending far anterior to the splenial foramen.

Teeth with the crowns moderately compressed and unequally bicuspid; those of premaxillary and adjacent part of maxillary bone and corresponding part of mandible, simple.

Dorsal vertebræ with zygosphen. In both *C. tessellatus* and *C. sexlineatus* there are five cervical intercentra besides that of the atlas, and the first rib is on the third or fourth vertebra. Two sacral diapophyses, both robust. Neural spines distinct, moderate, highest in the caudal series; ribs extending to sacrum. Diapophyses very short except in caudal region, where they extend for a considerable part of the length, originating posterior to the middle of the centrum. On the distal part of the caudal series there is an additional short spine-like diapophysis in front of the normal one, and the centrum is segmented between the two. The segmentation disappears anteriorly with the disappearance of this prediapophysis. Chevrons intercentral.

The suprascapula is of moderate dimensions and extends to the summit of the neural spine. Scapula elongate, and with a large proscapula. Coracoid with two deep notches. Interclavicle with a very long median limb, which is wide at the base and which covers an elongate oval median fontanelle. Three sternal ribs, and two attached to the xiphoid rod.

Ilium with a prominent *angulus cristæ*. Acetabulum entire; pubis directed anteriorly at an acute angle, with median pectineal angle. Ischia directed vertically downward, with *angulus tuberosus*, and pre- and post-ischiadic acuminate cartilages.

It is remarkable that in the large species of the allied genus *Tupinambis* the proscapular process is wanting.

The following are the characters of the species:

I. Nostril between the nasal plates. Males with a spine on each side the preanal region.

A. Ten-twelve longitudinal rows of ventral plates.

Brachial shields small, no post-antibrachials; 5 parietals; 4 supraoculars; femoral pores 29-35; olive, white-spotted.....*C. murinus*.

AA. Ventral plates in 8 longitudinal rows.

Large brachials; no post-antibrachials; 5 parietals; 4 supraoculars; femoral pores 19; olive above with a lighter dark-edged dorsal band.

C. esepentii.

Large brachials; no post-antibrachials; 5 parietals; 4 supraorbitals; femoral pores 18-24; olive with 5-9 light longitudinal stripes....*C. lemniscatus*.

Brachials very small; black or blackish brown with lines on the nape and spots on the outer side of the limbs*C. nigricolor*.

II. Nostril anterior to nasal suture.

1. Ventral plates in 10-12 longitudinal rows.

Dorsal scales granular; edge of collar granular; brachials large; no post-antibrachials; femoral pores 10-12; 3 parietals; 3-4 supraorbitals; olive with rows of black spots, and 1 or 2 white lines on each side...*C. laetoides*.

Dorsal scales coarse, flat; scales of collar very small; parietals 3; supraoculars 4; brachials large; olive with 9 longitudinal lines above.

C. longicauda.

2. Ventral plates in 8 longitudinal rows.

A. Scales of collar not larger at edge, which is more or less granular; supraorbitals 3 (parietals 3; no post-antibrachials).

Hind leg shorter, reaching meatus auditorius; anal scales continuous with abdominals; femoral scales in 6-7 rows; brachials larger; anals 10-12; usually five stripes on each side*C. deppei*.

Hind leg longer, reaching nasal suture; minute scales between abdominals and anals; femoral scales in 10-12 rows; brachials smaller; anals 10-12; only four stripes on each side.....*C. guttatus*.

AA. Scales of collar not larger at edge, which is more or less granular; supraorbitals 4 (parietals 3).

α. Prenasal not reaching second superior labial.

β. Post-antibrachial plates wanting.

Large; anal plates 10 or more; brachials in 4-5 rows; femoral pores 24-5; hind leg extended reaches ear; stripes broad and irregular*C. maximus*.

Medium; anal plates 5-6; brachials in 4-8 rows; femorals in 6-9; femoral pores 19-21; scales generally coarse; the hind leg extended reaches ear; stripes complete or broken up.

C. tessellatus.

Smaller; anal plates 8-10; brachials 6 rows; femorals 8; femoral pores 25; hind leg extended reaches prenasal plate; yellow spotted on olive ground.....*C. variolosus*.

Small; brachial plates 5 rows; femorals 6; femoral pores 17; scales smooth; striped; hind leg to ear.....*C. octolineatus*.

Small; brachial rows 6; femorals 4-5; femoral pores 17; scales rough; unicolor; hind leg to ear*C. inornatus*.

AAA. Collar with large scales, abruptly larger than the gulars.

α. Anterior nasal plate not reaching second superior labial.

β. Femoral pores 15 or more.

γ. No post-antibrachial plates.

Small; stripes persistent, no intermediate spots; femur with a stripe behind; femoral pores 15-17; head short, loreal plate higher than long; femoral scales 7-8 rows; 5 infra-labials*C. sezilmentus*.

Large; stripes more or less connected with spots which cut up the dark ground into spots and crossbars posteriorly; femur without strip behind; femoral pores 20-21; loreal plate longer than high; femoral scales 7-8 rows.

C. grahamii.

γγ. Post-antibrachial scales present.

Median gular scales smaller than those of collar; femoral pores 16-18; femoral scales in 8 rows; infralabials 6; 7 undulate black stripes on an olivaceous ground.

C. septemrillatus.

Median gular scales smaller than those of collar; femoral pores 18-23; muzzle elongate, loreal longer than high; dark bands interrupted by larger or smaller light spots or intervals *C. gularis.*

ββ. Femoral pores fewer than 15.

Femoral pores 12; 3 parietals; 3 supraorbitals; gray brown with 10 longitudinal stripes *C. multilineatus.*

Femoral pores 9-11; 5 parietals; 4 supracoculars; anals forming a triangle; olive brown with 6 stripes or some rows of spots.

C. ocellifer.

αα. Anterior nasal plate reaching second labial.

Femoral pores 13; one marginal anal plate; 6 white stripes; small.

C. labialis.

In this genus as in others, some characters which are constant in one species are inconstant in another. The presence or absence of the sixth infralabial, and of the frenoörbital plates, are of this nature. The number of femoral pores varies within a small range in all of the forms. Anomalies in the division of the head plates are rare, but sometimes occur in these genus. Such are the fusion of the symphyseal and postsymphyseal plates, the presence of an additional labial plate, etc.

The discrimination of the North American species of this genus is the most difficult problem in our herpetology. Nowhere are subspecies more clearly defined than in *Onemidophorus*, that is, definable geographical forms, which are not always true to their characters.

The color markings differ in the same individual at different ages, and the age at which the adult coloration is assumed differs in different localities. Some of the species, as for example, *Cnemidophorus sexlineatus*, never abandon the coloration of the young of other species and subspecies. The same condition is characteristic of the *C. deppei* of Mexico, the *C. lemniscatus* of Brazil, and other species. The process of color modification is, as I have pointed out,¹ as follows: The young are longitudinally striped from two to four stripes on each side of the middle line. With increasing age, light spots appear between the stripes in the dark interspaces. In a later stage these spots increase in transverse diameter, breaking up the dark bands into spots. In some of the forms these dark spots extend themselves transversely and unite with each other, forming black cross-stripes of greater or less length. Thus we have before us the process by which a longitudinally striped coloration is transformed into a transversely striped one.

¹ Proc. Amer. Phil. Soc., 1885, p. 283.

The large number of specimens of *C. tessellatus* and *C. gularis* in the U. S. National Museum collection show that the breaking up of the striped coloration appears first at the posterior part of the dorsal region (that is, the sacral and lumbar). The confluence of the spots appears there first; and finally (*C. gularis semifasciatus*), where the color markings disappear, leaving a uniform hue, this also appears first at the posterior part of the body. In the *C. tessellatus rubidus* the dark spots disappear first on the anterior regions.

The species of *Cnemidophorus* inhabit dry open ground where they can observe their insect prey and watch their enemies. From the latter they escape by the extreme rapidity of their movements, which renders it difficult to follow them with the eye, to which they appear as a streak flying over the ground. For this reason they are popularly known as "swifts." They are nevertheless frequently caught and eaten by snakes.

Of the species enumerated in the synopsis above given, eight are not found in the Nearctic realm. Thus *C. guttatus* and *C. deppei* are restricted to the Central American district, and *C. espeutii* to certain islands of the eastern coast of Central America. *C. murinus* and *C. nigricolor* belong to the northern parts of South America, and *C. ocellifer*, *C. lacertoides*, and *C. longicauda* to the southern parts of that continent. *C. leumiscatus* inhabits tropical South America east of the Andes.

CNEMIDOPHORUS MAXIMUS Cope.

Cnemidophorus maximus COPE, Proc. Acad. Nat. Sci. Phila., 1863, p. 104; Trans. Amer. Phil. Soc., 1892, pp. 28-32.

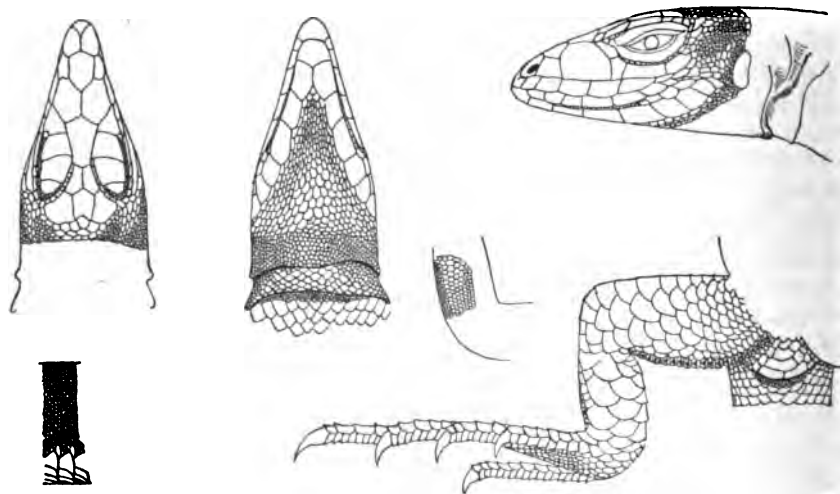


Fig. 104.

CNEMIDOPHORUS MAXIMUS COPE.

= 1.

Lower California.

Cat. No. 19662, U.S.N.M.

The largest species of the genus, equaling many of the *Ameivas* in dimensions. Plates of the collar graduating anteriorly into the posterior gular, the series concave anteriorly in the middle, leaving smaller scales on the margin. Anterior gulars abruptly larger, the median largest. Nostril in nasorostral; superorbitals four, frontoparietals separated. Interparietal (in adult) nearly as broad as long; parietals large. Infralabials five. Preanals in four transverse series, the posterior two containing six. Tibials four, femorals seven, abdominals eight, antebrachials (often an unreliable character) four, brachials seven-rowed. Dorsal scales minute. Above olive-brown, with three brown bands on each side, which are as wide as the intervals between them, and are so broken by spots of the ground-color as to resemble series of confluent brown variations. Posterior extremities coarsely reticulate with the same color. Superior surface of tail and gular region blackish varied; abdominal shields black tipped. Under surface of tail and hinder extremities yellow. Upper surface crossbarred, so as to appear annulate in some specimens.

Differs from the *C. tessellatus*, its nearest ally, in its smaller and more numerous preanal plates, its smaller dorsal scales, and broader light bands, as well as in its superior size.

Cnemidophorus marinus Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
5297	1	Cape St. Lucas, L. California.		J. Xantus	Alcoholic.
12636	3	La Paz, L. California.	Feb., 1882	L. Belding.	do.
12652	1	do	do	do.	do.
12658	2	Espiritu Santa Island		do.	do.

This species varies in the number of its anal plates, some specimens having fewer than others. The brachial plates also vary in number from six to eight rows. Two young specimens (Cat. No. 12658), in which the umbilical fissure is still open, are about as large as the adult *C. sexlineatus*. They have a median dorsal light stripe, and two on each side on a blackish ground. Each of the two dark bands thus produced is marked by two rows of pale spots. In this they differ from the spotted striped forms of the *C. tessellatus* and *C. guttatus*, which have but one series of such spots. The femur and tibia are crossbarred, and the former is not marked with a longitudinal stripe behind.

CNEMIDOPHORUS TESSELLATUS Say.

Cnemidophorus tessellatus BAIRD, U. S. Pac. R. R. Surveys, X, 1859, Gunnison's Report, p. 18.—COPE, Check List Batr. Rept. N. Amer., 1875, p. 46; Trans. Amer. Phil. Soc., 1892, p. 33.

Ameiva tessellata SAY, Long's Exped. Rocky Mts., II, 1823, p. 50.

Scales of the back and sides generally coarse, .5 mm. in diameter. Scales of the collar not larger than those of the throat, the edge of the

collar with smaller often granular scales. Four supraorbital scales, the posterior smaller than the others. These are separated from both the superciliaries and the frontal and frontoparietal by granular scales whose extension anteriorly differs in different individuals. Frontoparietals as large as the parietals, truncate in front. Interparietal longer than broad, longer than each parietal. The latter undivided. A transverse series of small plates bound the parietals and interparietals posteriorly. Frenal plate longer than postnasal. One row of scuta in front of orbit and below orbit, separating the latter from the superior labials. Superior labials five to below middle of orbit, the fifth acuminate posteriorly. Infralabials five.

Brachial scales in four to eight longitudinal rows (rarely five) counted at the middle, continuous with antebrachials, which are in three rows (rarely two). Post-antebrachials small, uniform. Femoral plates in seven to nine rows (counted at middle and to the line of pores) and tibial plates in three longitudinal rows. Femoral pores varying from nineteen to twenty-one in number.

Color varying from olivaceous black to olivaceous brown, which is marked by light yellow or orange longitudinal stripes or spots on the dark ground, or reversed by black spots on a light ground. The head is unspotted and unstriped, except occasional maculations of the gular region. Belly from yellowish to black or spotted. Limbs crossbarred or spotted, and not distinctly striped posteriorly.

The size varies from a length of head and body of 86 mm. to 102 mm. In the former the total length is 260 mm.; in the latter, 350 mm. For more detailed measurements see under the respective subspecies.

This species ranges over the Sonoran and Lower Californian regions and the Pacific, nearly to the northern boundary of California. Its distribution is somewhat coincident with that of the *Eutania elegans* (omitting the Rocky Mountains proper), and its eastern border is overlapped by the range of the eastern *C. sexlineatus*. The range of variations of color seen in the *C. tessellatus* is about the same as that seen in the *C. gularis*, although, with a few exceptions, the subspecies of the two may be distinguished from each other by color characteristics without examining the scale characters. The parallelism is, however, very close, and shows the same line of modifications. I refer more especially to these under the head of *C. gularis*.

The subspecies of the *C. tessellatus* are five, as follows:

I. Brachial scales 4-5 rows; femorals 6-7 rows.

Blackish olive above, with a median dorsal paler stripe, and three similar stripes on each side; belly and throat unspotted. *C. t. perplexus*.

Two pale stripes on each side only, the interspaces pale spotted, and frequently broken up into black or olive spots so as to destroy their integrity; generally sparsely black spotted below. *C. t. tessellatus*.

No stripes, but 12-14 longitudinal series of pale spots on an olivaceous ground, more or less confluent; hind legs with numerous pale spots; thorax, collar, and more or less of throat black. *C. t. melanostethus*.

II. Brachial scales in 5-6 rows; femorals 8-9 rows.

No stripes; ground color dove brown, with three rows of more or less obsolete black spots on the back and vertical black bars on the sides; abdominal plates pale, black edged; hands and inferior faces of hind legs and tail red; larger *C. t. rubidus*.

III. Brachial scales 7-8 rows; femorals in 8-9 rows.

Four light stripes above, interrupted and connected with light spots and lines in the black interspaces; sides, throat and inferior surfaces variegated black and white; medium *C. t. multiscutatus*.

CNEMIDOPHORUS TESSELLATUS PERPLEXUS Baird and Girard.

Cnemidophorus perplexus BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 128.—COPE, Check List Batr. Rept. N. Amer., 1875, p. 46.

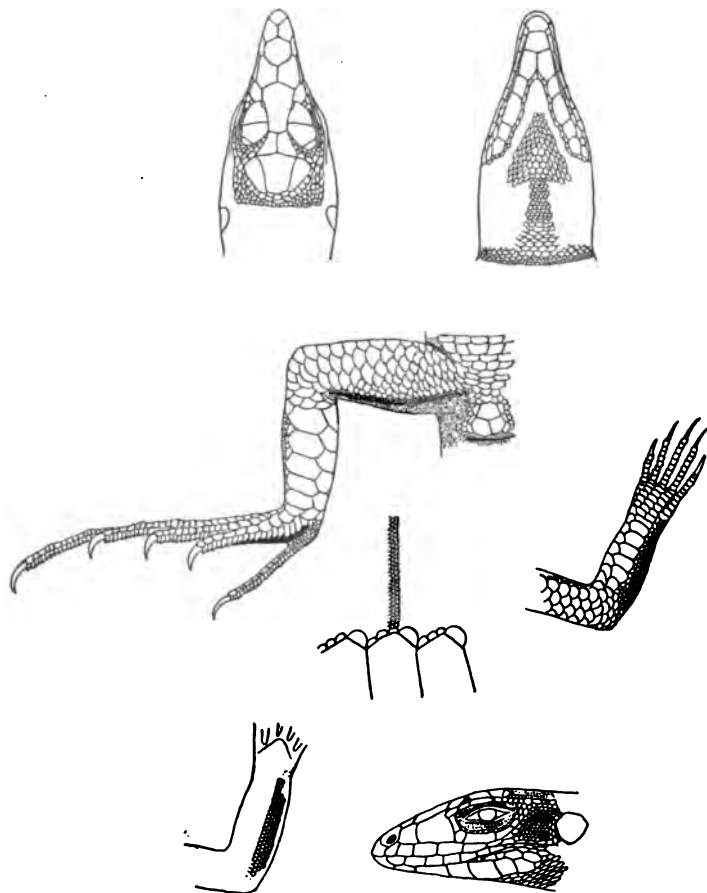


Fig. 105.

CNEMIDOPHORUS TESSELLATUS PERPLEXUS BAIRD AND GIRARD.

=1.

Texas.

Cat. No. 3060, U.S.N.M.

In the type specimen of this subspecies the interparietal plate is narrower than the parietals, and is twice as long as wide. The frenal is

longer than the postnasal, and there is no frenoorbital. The first pair of infralabials are in contact on the median line throughout their length. Besides these there are four infralabials on each side, which are separated from the inferior labials by four plates on each side, which are preceded by a few granules. There are four rows of brachial and three rows of antebrachial scuta (only two rows at the middle of the forearm). The femorals are in seven rows, the second from the front the largest. The tibials are in three rows, the front the largest. There are three large anal plates, two posterior and followed by a granular space anterior to the vent. The edge of the collar is granular, and the granules form a triangular area with the apex forward. On each side of this the scales are about as large as those on the middle of the throat between the jaws. The extremity of the fourth toe of the extended hind limb reaches to halfway between the humerus and the ear. Femoral pores 19 on each side.

Measurements.—Total length, 260 mm.; length of head and body, 86 mm.; length of head to angle of jaws, 22 mm.; to edge of collar, 26 mm.; to axilla, 31 mm.; length of forearm from axilla, 27 mm.; length of fore foot, 11 mm.; length of hind leg, 58 mm.; length of hind foot, 30 mm.; width of head behind orbit, 10 mm.

The color has already been mainly described. The thigh and tibia are longitudinally marbled with dark olive on a pale olive ground. Head, fore limbs, and tail unspotted.

The specimen described is the largest obtained, and it is probably adult. Its colors are rather obsolete, while those of three younger specimens are as strongly contrasted as in the young of any other form. Among all the striped forms of the *C. tessellatus*, this one is distinguished by the presence of seven stripes and no spots. It is, so far as yet known, confined to the valley of the Rio Grande River.

Cnemidophorus tessellatus perplexus Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
3050	2	Texas .....	.....	Gen. Churchill, U. S. A. . .	Alcoholic.
3030	1	do .....	.....	Dr. C. B. R. Kennerly . . .	do.
8519	1	San Ildefonso, New Mexico	Aug.—, 1874	Dr. H. C. Yarrow	do.
22383	1	Mesilla, New Mexico . . .	.....	T. D. A. Cockerell	do.

A specimen in the museum of the school of biology of the University of Pennsylvania, of about the size of the type above described, agrees in all important respects with it, with the following exceptions: The second and third infralabial plates are in contact with the labials and not separated by plates, although some minute granules are present. There are six rows of brachial plates at the middle of the humerus and three of antebrachials. The light and dark stripes present a strong contrast of color, the former being rosy and the latter pure black. The third black stripe on each side is broken into approximated

blocks. The lateral abdominal plates are black at the base, leaving a light stripe below the inferior black one, not well defined below. This gives the appearance of four light stripes on each side instead of three. Four black spots between orbit and ear, and a few on posterior labials and front of orbit. Legs striped and reticulate with black on a pale ground. I add that there are 19 femoral pores, and that the extended hind leg reaches the front border of the auricular meatus.

This form approximates this subspecies to the *C. t. tessellatus*. The habitat of the specimen is unknown.

CNEMIDOPHORUS TESSELLATUS TESSELLATUS Say.¹

Cnemidophorus tessellatus BAIRD, U. S. Pac. R. R. Surv., X, 1859, Gunnison's Rept., p. 18.—COPE, Check List Batr. Rept. N. Amer., p. 46.

Ameiva tessellata SAY, Long's Exped. Rocky Mts., II, 1823, p. 50.

Cnemidophorus gracilis BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 128.—BAIRD, U. S. Mex. Bound. Surv. Rept. II, Pt. 2, Reptiles, p. 10, pl. XXXIV, figs. 7-14.

Cnemidophorus marmoratus BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 128.

Cnemidophorus tigris BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, 1852, p. 69.—BAIRD, U. S. Mex. Bound. Surv. Rept., 1859, II, Pt. 2, Reptiles, p. 10, pl. XXXIII.

Cnemidophorus tessellatus tigris COPE, Check List Batr. Rept. N. Amer., 1875, p. 46.

Cnemidophorus undulatus HALLOWELL, Proc. Acad. Nat. Sci. Phila., VII, 1854, p. 94.

The scale characters of this subspecies are much like those of the *C. t. perplexus*. The interparietal plate is generally larger, exceeding the parietals, and being nearly as wide in front as it is long. The first pair of infralabials is separated by scales posteriorly. The larger scales of the mesoptychium extend all the way across it, and they are preceded by a considerable tract of small scales, which are in turn preceded by the large gulars rather abruptly. The brachial scales are in four rows and the antebrachials in three. The femorals are in seven (rarely six or eight) and the tibials in three. Femoral pores from 19 to 21. The hind limb extended, reaches the tympanic meatus with the end of the longest toe. The anal plates are four to six in number—two posterior and two arranged anteroposteriorly in front of them.

Measurements.—Total length, 335 mm.; length of head and body to vent, 102 mm.; length of head to angle of mandible, 26 mm.; length to collar, 35 mm.; length to axilla, 42 mm.; length of foreleg, 34 mm.; length of fore foot, 16 mm.; length of hind leg, 73 mm.; length of hind foot, 37 mm.

The adult differs from the young in color, and its colors may be best understood by reference to the latter. In this stage the ground color of the back and sides is black or blackish-olive, and it is traversed by two light-yellowish stripes on each side. One of these starts at the occipital plate and the other at the superciliary angle. The lateral

¹ Description from a specimen from the Canyon of the Arkansas, Colorado.

stripe, which extends from above the auricular meatus in the *C. t. perplexus*, is here wanting. There is sometimes a trace of a median dorsal stripe, but generally not. Faint longitudinal lines are sometimes present between the stripes mentioned. On the sides below the external stripe are three series of more or less longitudinal spots, which outline three stripes; but they are not connected, excepting sometimes in the transverse direction. This stage represents the *C. gracilis* Baird and Girard.

In maturer specimens rounded spots appear between the longitudinal stripes, and the lateral spots become connected transversely, so as to

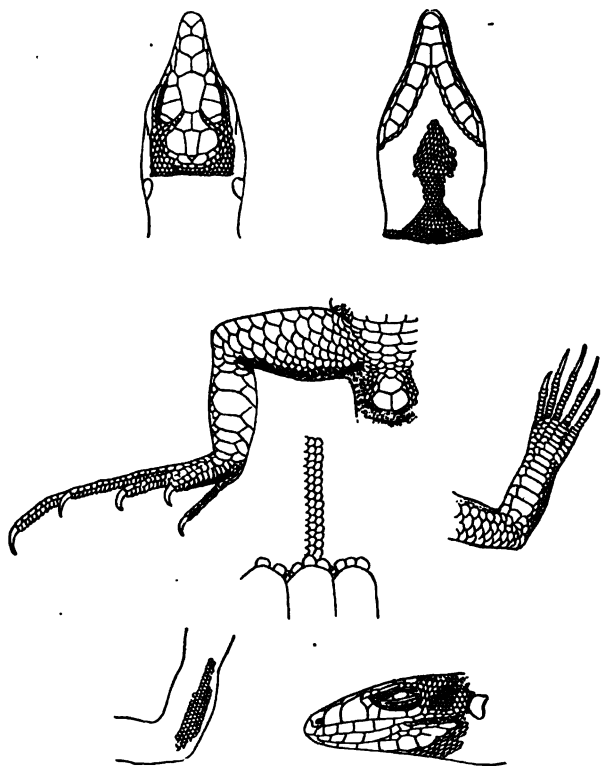


Fig. 106.

CNEMIDOPHORUS TESSELLATUS TESSELLATUS SAY.

=1.

Utah.

Cat. No. 3047, U.S.N.M.

leave the dark ground color in the form of irregular transverse bars (Cat. Nos. 3047, 4970, 15619). In some specimens the median dorsal stripe is distinct, and is even divided into two (Cat. No. 11978). Such specimens have six stripes, very close together, and only the external pair on each side are homologous of those of the *C. sexlineatus* and *C. gularis*. In the majority of adult specimens the light spots expand transversely and produce an emargination on one side or the other of

the black ground, or cut it into sections or spots by expanding in both directions. In the former case the dark stripes become irregular or undulate in outline. This is their usual condition on the anterior part of the body. On the posterior part of the body the dark ground is usually broken into spots. In the type specimen of the *C. tigris* Baird and Girard, the breaking up of the black intervals has not been completed, although the specimen is of full size. In typical specimens this part

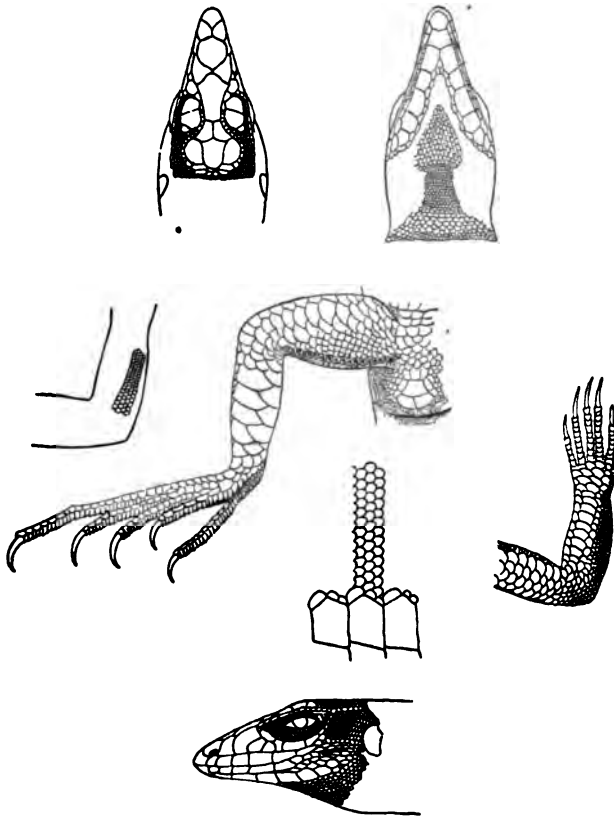


Fig. 107.

CNEMIDOPHORUS TESSELLATUS TESSELLATUS SAY, β .

= 1.

Utah.

Cat. No. 4113, U.S.N.M.

of the body is marked by three longitudinal rows of transverse black spots. The upper surface of the tail is generally marked with brown spots, sometimes rather large, but in other specimens confined to the keels of the scales. In some they are wanting.

In the last modification the traces of stripes have almost or quite disappeared. The upper pair are first to be interrupted by transverse and oblique extensions of the irregularly shaped black spots, and the inferior stripes are finally interrupted and lost in the same manner.

Thus, in Cat. Nos. 8633 and 3048a, the spots are transversely confluent in every direction, leaving only irregular areas of the white color, now become the ground. These approach nearest to the *C. t. variolosus* Cope and represent the *C. marmoratus* of Baird and Girard. In the type of that supposed species a trace of the inferior stripe remains on each side. The end of the fourth toe of the extended posterior foot reaches

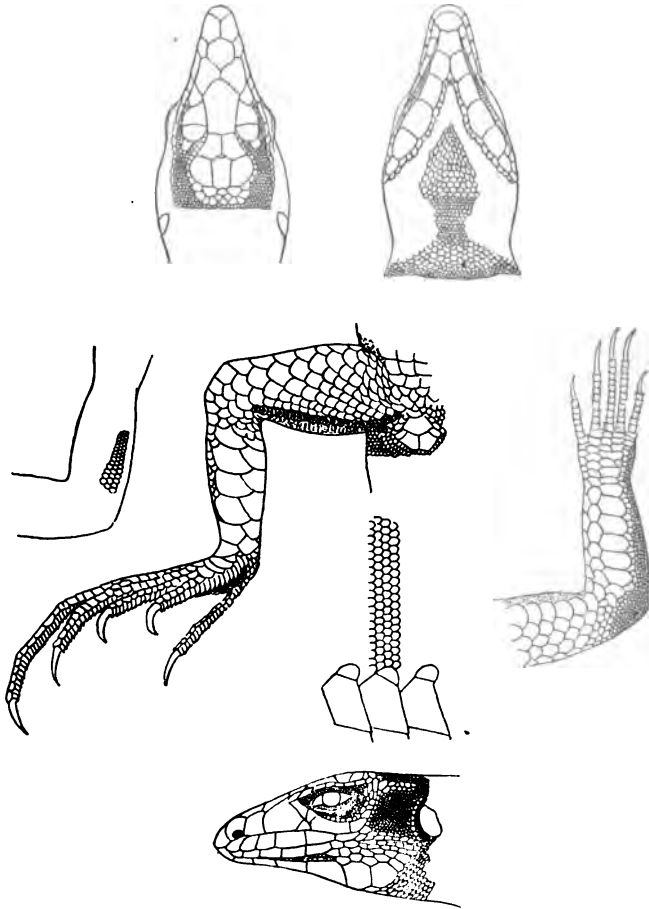


Fig. 108.

CNEMIDOPHORUS TESSELLATUS TESSELLATUS SAY, γ.

= 1.

Cat. No. 3048, U.S.N.M.

the *meatus auditorius*, and there are twenty femoral pores on each side. The length of the head and body is 85 mm.; in Cat. No. 8633 it is 100 mm.

The habits of *Cnemidophorus tessellatus tigris* are referred to by Dr. Merriam in his report on the Death Valley expedition, as follows:

The whip-tail lizard is nearly as common as the gridiron tail in much of the area traversed, but is not so strictly confined to the Lower Sonoran Zone, ranging up a

short distance into the Upper Sonoran, and consequently reaching some valleys in which the former species is absent. In this respect it resembles the leopard lizard (*Crotaphytus wislizenii*), with which it is usually found. It lives on the open desert and runs with great rapidity when alarmed.

In California it is abundant in the Mohave Desert, where it ranges westward through Antelope Valley to the Cañada de las Uvas (changing to subspecies *undulatus*), and southward in the wash leading from near Gorman station toward Peru Creek, in the Sierra Liebré. In the open cañon leading up to Tehachapi Valley from the Mohave Desert it ranges all the way to the summit of the pass (at Cameron) and probably throughout Tehachapi Valley also, but was not seen there because of a severe cold wind, which lasted all day at the time we passed through. It ranges up from the Mohave Desert over Walker Pass and down on the west slope to the valley of Kern River, where it changes to subspecies *undulatus*. It is common in Owens Valley, and ranges thence up on the warm, west slope of the Inyo and White Mountains to 2,130 meters (7,000 feet) or higher, opposite Big Pine; and is tolerably common also in Deep Spring Valley. It is common in Panamint, Death, and Mesquite Valleys, ranging from the latter through Grapevine Cañon to Sarcobatus Flat. In Nevada it is common in the Amargosa, Pah-rump, and Vegas Valleys, at the Bend of the Colorado, in the valleys of the Virgin and Muddy, and reaches Oasis, Pahrana-gat, Desert, and Meadow Creek Valleys, and from the latter ranges up among the junipers on the west slope of the Juniper Mountains, to an altitude of 1,980 meters (6,500 feet). In Utah it is common in the Lower Santa Clara Valley, and thence ranges northward to the Upper Santa Clara Crossing, but disappears before reaching Mountain Meadows.

The food of *Cnemidophorus tigris* consists of grasshoppers and other insects; no leaves or flowers were found in the numerous stomachs examined.

Hallowell in describing this subspecies as *C. undulatus* recognized the difference between it and the *C. t. perplexus*, remarking that the present form has but two light stripes on each side.

This form ranges the Sonoran region to Utah inclusive, and extends to the northern part of California.

Cnemidophorus tessellatus tessellatus Say.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3034	1	Colorado Desert	Dr. J. L. Le Conte	Alcoholic.
3067	12	Colorado River, Arizona	H. B. Möllhausen	do.
9270	1	McCloud River, California	L. Stone	do.
8630	1	Southern California	G. A. Hasson	do.
3034	1	Colorado Desert	Dr. J. L. Le Conte	Alcoholic (type of <i>C. gracilis</i>).
8631	1	Los Angeles, California	Wm. Somers	Alcoholic.
15619*	1	St. Thomas, Nevada	Dr. E. Palmer	do.
11635				
11978	4	Cerro Island, California	L. Belding	
3028	1	Near latitude 38°	Lieutenant Beckwith	Alcoholic (type of <i>C. tessellatus</i> Baird and Girard).

Cnemidophorus tessellatus tessellatus Say—Continued.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3047	1	Salt Lake, Utah	Capt. H. Stansbury	Alcoholic.
4970	1	Southern Utah.....	Dr. Brewer	do.
11737	1	Camp 12, Nevada.....	E. Ridgway.....	do.
4979	1	Fort Tejon, California	J. Xantus.....	do.
5065	1	Peccos River, Texas .....	.....	do.
4113	2	Fort Tejon, California	J. Xantus.....	do.
3061	1	California.....	Dr. J. Kirtland.....	Alcoholic (type of <i>C. tigris</i> Baird and Girard).
3040	2	Fort Yuma, Arizona.....	Dr. A. L. Heermann.....	Alcoholic (type of <i>C. undulatus</i> Hall).
4103	1	Salt Lake, Utah	?	Alcoholic.
5019	2	Fort Buchanan, Arizona.....	Dr. B. I. D. Irwin, U. S. A	do.
11791	4	Fresno, California	G. Eisen	do.
11762	3	do	do	do.
11808	1	McCloud River, California.....	L. Stone	do.
15619	1	St. Thomas, Nevada.....	Dr. E. Palmer.....	do.
3024	2	Between San Antonio and El Paso, Texas.....	Col. J. D. Graham	Alcoholic (type of <i>C. marmoratus</i> Baird and Girard)
3036	1	Laredo, Texas	Gov. Stevens	Alcoholic.
3048a	1	.....	J. S. Newberry	do.
8633	1	Fort Tejon, California	H. W. Henshaw.....	do.
20485	1	Witch Creek, San Diego County, California.....	do	("C. tigris.")
20815	1	Carlin, Elko County, Nevada	Julius Hurter	do.
22270	1	Las Cruces, New Mexico.....	T. D. S. Cockerell	do.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When collected.	From whom received.
			<i>Feet.</i>		
18462	Adult..	Santa Clara Valley, Utah.....		May 11	Merriam.
18463	Male ..	Pahrump Valley, Nevada		Apr. 28	do.
18464	Male ..	do		Apr. 29	Bailey.
18465	Adult ..	Pahranaagat Valley, Nevada.....		May 25	Merriam
18466	Adult ..	do		do ..	Bailey.
18467	Adult ..	Oasis Valley, Nevada	4,600	June 2	do.
18468	Adult ..	Callville, Nevada.....		May 4	do.
18469	Male ..	Coso Mountains, Coso, California		May 18	Fisher.
18470	Female.	do		May 20	do.
18471	Male ..	Argus Range, Shepherd Canyon, California		Apr. 27	do.
18472	Male ..	do		Apr. 28	do.
18473	Female.	do		do ..	do.
18474	Male ¹	do		do ..	do.
18475	Male ..	Argus Range, Coso Valley, California		May 11	do.
18476	Male ..	Argus Range, Searl's Garden, California		Apr. 24	Stephens.
18477	Adult ..	Panamint Mountains, Willow Creek, California	4,600	May 18	Nelson.
18478	Male ..	Panamint Valley, Hot Springs, California		Apr. 22	Merriam.
18479	Adult ..	Lone Pine, California.....		June 11	Fisher.
18480	Adult ..	do		June 6	Palmer.
18481	Young ..	Death Valley, California		Mar. 22	Nelson.
18482	Adult ..	Death Valley, Furnace Creek, California.....		June 20	Fisher.
18483	Young ..	do		Jan. 29	do.
18484	Adult ..	do		Apr. 10	Merriam.
18485	Adult ..	Death Valley Bennett Wells, California		Apr. 1	Bailey.
18486	Adult ..	do		do ..	do.
18487	Adult ..	do		Apr. 4	do.
18488	Adult ..	do		do ..	do.
18489	Young ..	do		Jan. 22	do.
18490	Male ..	Mohave Desert, Leach Point Valley, California		Apr. 25	Merriam.
18491	Female.	do		do ..	do.
18492	Female.	Owens Lake, mouth of canyon 5 miles southwest of Olancho, California.....	4,000	June 8	Stephens.
18493	Female.	Owens Lake, Olancho, California.....	3,700	May 19	do.
18494	Adult ..	Deep Spring Valley, California.....	5,300	June 9	Merriam.

¹ Young.

CNEMIDOPHORUS TESSELLATUS MELANOSTETHUS Cope.

Cnemidophorus tessellatus melanostethus COPE, Check List Batr. Rept. N. Amer., 1875, p. 46.

Cnemidophorus melanostethus COPE, Proc. Acad. Nat. Sci. Phila., 1863, p. 104.

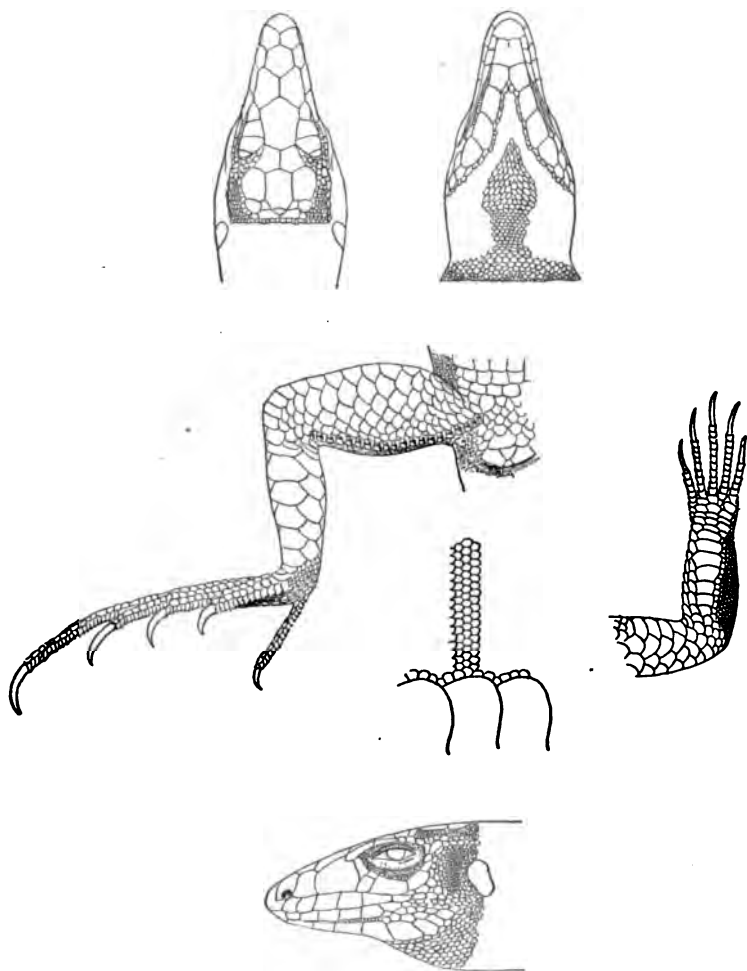


Fig. 109.

CNEMIDOPHORUS TESSELLATUS MELANOSTETHUS COPE.

= 1.

Arizona.

Cat. No. 3067, U.S.N.M.

Introparietal plate longer but narrower than the parietals. Posterior supraorbital, not rudimental. First pair of infralabials divaricate behind. Mesoptychial scales homogeneous, smaller, but not granular at the border. Anal plates four, two marginal, the others anteroposterior. Dorsal scales coarse, in transverse rows, the posterior edges

Cnemidophorus tessellatus tessellatus Say—Continued.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3047	1	Salt Lake, Utah	Capt. H. Stansbury	Alcoholic.
4970	1	Southern Utah	Dr. Brewer	do.
11737	1	Camp 12, Nevada	R. Ridgway	do.
4978	1	Fort Tejon, California	J. Xantus	do.
5065	1	Pecos River, Texas	do.	do.
4113	2	Fort Tejon, California	J. Xantus	do.
3061	1	California	Dr. J. Kirtland	Alcoholic (type of <i>C. tigris</i> Baird and Girard)
3040	2	Fort Yuma, Arizona	Dr. A. L. Heermann	Alcoholic (type of <i>C. undulatus</i> Hall).
4103	1	Salt Lake, Utah	?	Alcoholic.
5019	2	Fort Buchanan, Arizona	Dr. B. I. D. Irwin, U. S. A	do.
11791	4	Fresno, California	G. Eisen	do.
11782	3	do	do	do.
11808	1	McCloud River, California	L. Stone	do.
15619	1	St. Thomas, Nevada	Dr. E. Palmer	do.
3024	2	Between San Antonio and El Paso, Texas	Col. J. D. Graham	Alcoholic (type of <i>C. marmoratus</i> Baird and Girard)
3038	1	Laredo, Texas	Gov. Stevens	Alcoholic.
3048a	1	do	J. S. Newberry	do.
8632	1	Fort Tejon, California	H. W. Henshaw	do.
20485	1	Witch Creek, San Diego County, California	do	("C. tigris.")
20815	1	Carlin, Elko County, Nevada	Julius Hurter	
22270	1	Las Cruces, New Mexico	T. D. S. Cockerell	

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When collected.	From whom received.
			<i>Feet.</i>		
18462	Adult ..	Santa Clara Valley, Utah		May 11	Merriam.
18463	Male ..	Pahrump Valley, Nevada		Apr. 28	do.
18464	Male ..	do		Apr. 29	Bailey.
18465	Adult ..	Pahrangat Valley, Nevada		May 25	Merriam
18466	Adult ..	do		do ..	Bailey.
18467	Adult ..	Oasis Valley, Nevada	4,600	June 2	do.
18468	Adult ..	Callville, Nevada		May 4	do.
18469	Male ..	Coso Mountains, Coso, California		May 18	Fisher.
18470	Female ..	do		May 20	do.
18471	Male ..	Argus Range, Shepherd Canyon, California		Apr. 27	do.
18472	Male ..	do		Apr. 28	do.
18473	Female ..	do		do ..	do.
18474	Male ¹ ..	do		do ..	do.
18475	Male ..	Argus Range, Coso Valley, California		May 11	do.
18476	Male ..	Argus Range, Searl's Garden, California		Apr. 24	Stephens.
18477	Adult ..	Panmint Mountains, Willow Creek, California	4,600	May 18	Nelson.
18478	Male ..	Panmint Valley, Hot Springs, California		Apr. 22	Merriam.
18479	Adult ..	Lone Pine, California		June 11	Fisher.
18480	Adult ..	do		June 6	Palmer.
18481	Young ..	Death Valley, California		Mar. 22	Nelson.
18482	Adult ..	Death Valley, Furnace Creek, California		June 20	Fisher.
18483	Young ..	do		Jan. 29	do.
18484	Adult ..	do		Apr. 10	Merriam.
18485	Adult ..	Death Valley Bennett Wells, California		Apr. 1	Bailey.
18486	Adult ..	do		do ..	do.
18487	Adult ..	do		Apr. 4	do.
18488	Adult ..	do		do ..	do.
18489	Young ..	do		Jan. 22	do.
18490	Male ..	Mohave Desert, Leach Point Valley, California		Apr. 25	Merriam.
18491	Female ..	do		do ..	do.
18492	Female ..	Owens Lake, mouth of canyon 5 miles southwest of Olancha, California	4,000	June 8	Stephens.
18493	Female ..	Owens Lake, Olancha, California	3,700	May 19	do.
18494	Adult ..	Deep Spring Valley, California	5,300	June 9	Merriam.

¹ Young.

CNEMIDOPHORUS TESSELLATUS MELANOSTETHUS Cope.

Cnemidophorus tessellatus melanostethus COPE, Check List Batr. Rept. N. Amer., 1875, p. 46.

Cnemidophorus melanostethus COPE, Proc. Acad. Nat. Sci. Phila., 1863, p. 104.

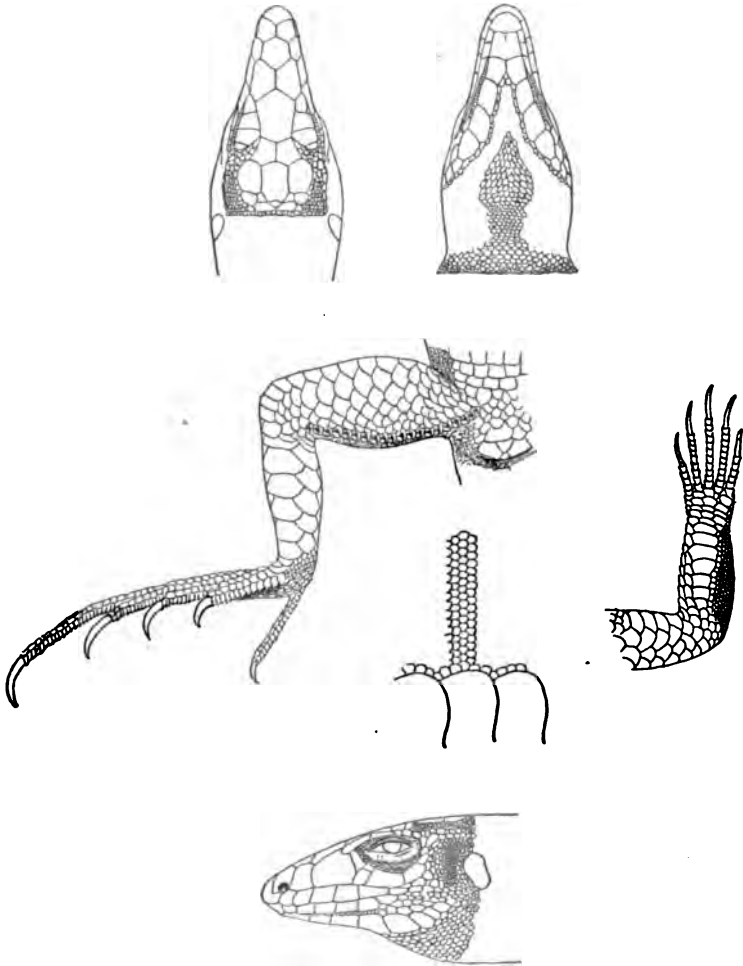


Fig. 109.

CNEMIDOPHORUS TESSELLATUS MELANOSTETHUS COPE.

=1.

Arizona.

Cat. No. 3067, U.S.N.M.

Introparietal plate longer but narrower than the parietals. Posterior supraorbital, not rudimental. First pair of infralabials divaricate behind. Mesoptychial scales homogeneous, smaller, but not granular at the border. Anal plates four, two marginal, the others anteroposterior. Dorsal scales coarse, in transverse rows, the posterior edges

fore leg, 27 mm.; length of fore foot, 13.5 mm.; length of hind leg, 60 mm.; length of hind foot, 32 mm.

A form very much like this subspecies has been named *C. martyr* by Stejneger.¹ The two known specimens differ from the *C. t. melanostethus* in their smaller size and in the extension of the black over the entire inferior surface. It is doubtful whether it can be regarded as a subspecies. It is from the island of San Martir, Gulf of California.

CNEMIDOPHORUS TESSELLATUS RUBIDUS Cope.

Cnemidophorus tessellatus rubidus COPE, Trans. Amer. Phil. Soc., 1892, p. 36, pl. XII, fig. F.

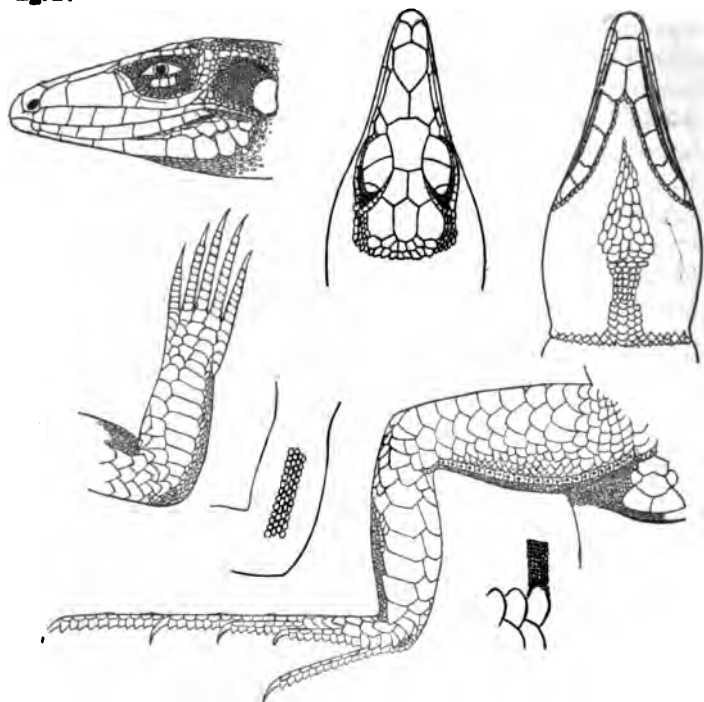


Fig. 110.

CNEMIDOPHORUS TESSELLATUS RUBIDUS COPE.

= 1.

Lower California.

Cat. No. 16153, U.S.N.M.

This elegant form is represented in the national collection by seven individuals, of which three are adult. To the usual characters of the species it adds some others. Thus the scales are rather finer, being less than 0.5 mm. in diameter. The femoral scales are more numerous. Femoral pores twenty-two. Small scales of collar border not granular.

There are three parietals, and the longest toe reaches the auricular meatus. There are the usual three anals, with one in front of the

¹ Proc. U. S. Nat. Mus., XIV, 1890, p. 407.

median, which is, with the latter, bounded by a few scales on the sides. Median gular scales rather coarse, and abruptly contrasted with the posterior gulars in a transverse line. Loreal longer than high. Small scales above anterior canthus of eye numerous and rather prominent. The keels of the caudal scales are prominent, and, except at the base of the tail, in continuous lines.

The color of the upper surfaces in the adult is a dove brown. This is marked on the back by three series of transverse black spots, which are well separated from each other. In one specimen the spots are very narrow; in another they are nearly obsolete on the anterior part of the back. On the sides similar black spots are more or less confluent into vertical black stripes. The head and fore legs are uniform brown above; the hind limbs have on a similar ground narrow blackish cross-bars, sometimes indistinct. Tail pale brown above, with olive and brown spots. Inferior surfaces straw-colored tinged with green, and varied with black and red. The abdominal scuta are black bordered, and the throat is black spotted, sometimes strongly, sometimes faintly. The palms and sometimes the entire inferior surface of the anus is a bright vermillion. Posterior and inferior sides of femora, inferior aspect of tibia, and inferior side and distal half of tail bright vermillion.

The young specimens have traces of six longitudinal stripes of an olivaceous or light-brown color, and the spaces between them are cross-barred with black and olive, as in the *C. gularis mariarum*, which this form closely resembles at this stage. The black spots become more distinct with age, and the interspaces blend completely with the stripes, so that the latter are ultimately completely lost in a common ground color. The femora are reticulated with black on an orange ground above. The black and red of the inferior surfaces are not so pronounced as in the adult.

Measurements.—Total length, 340 mm.; length to posterior edge of ear, 24 mm.; length to collar, 34 mm.; length to vent, 100 mm.; length of fore limb, 35 mm.; length of hind limb, 72 mm.; length of hind foot, 36 mm.

Cnemidophorus tessellatus rubidus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.
15149	1	St. Margarita Island, Lower California.	U. S. Fish Com. steamer <i>Albatross</i> .
15150	1	do.....	do.
15151	1	do.....	do.
15152	1	do.....	do.
15153	1	do.....	do.
15154	1	do.....	do.
15155	1	do.....	do.

mm.; of head to angle of mandible, 10 mm.; to collar, 24 mm.; to axilla, 31 mm.; length of fore leg, 27 mm.; of fore foot, 12 mm.; of hind leg, 55 mm.; of hind foot, 30 mm.

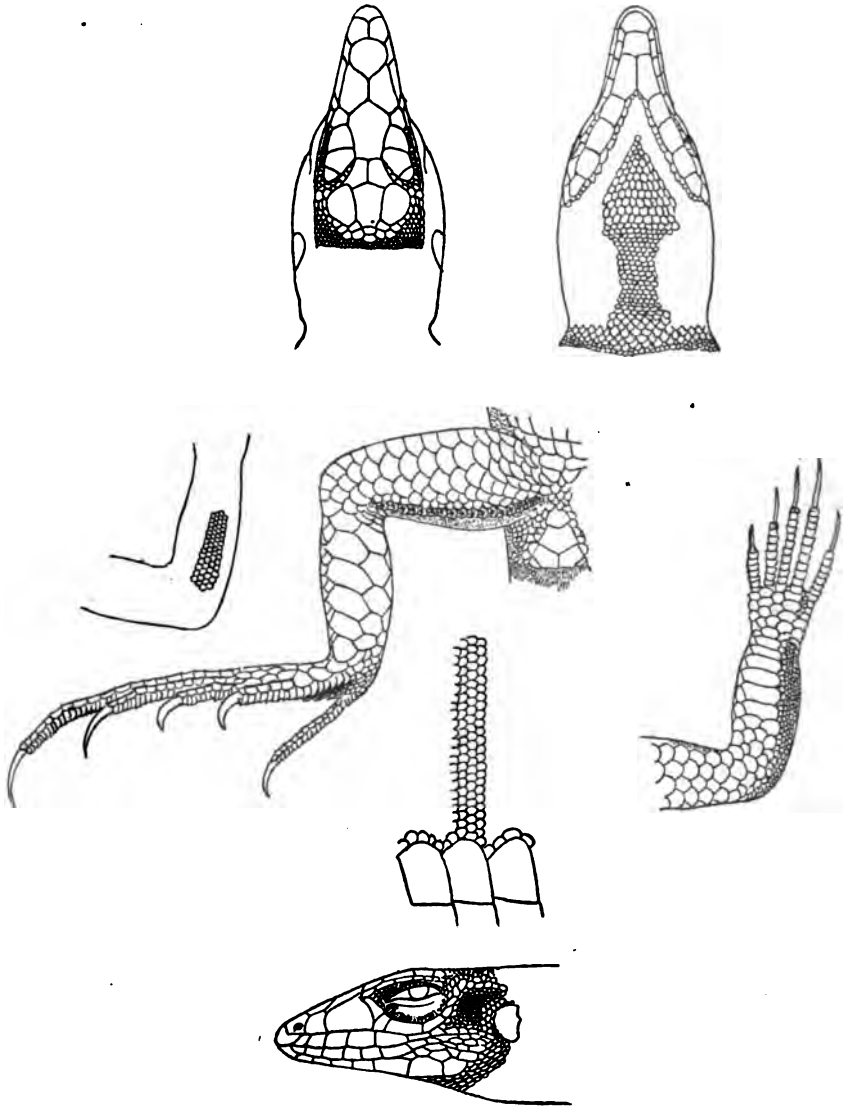


Fig. 112.

CNEMIDOPHORUS TESSELLATUS VARIOLOSUS COPE.

= 1.

Coahuila.

Cat. No. 3060, U.S.N.M.

The typical specimen is of a size which would be fully striped if it belonged to the *C. maximus* or *C. tessellatus*, being that of the eastern *C. sexlineatus*. There are, however, no stripes, but the olivaceous

ground of the superior surfaces is marked with numerous rather small yellowish oval spots. Those of the sides are irregularly disposed, but those of the superior surfaces are arranged in six more or less irregular series. Of these the two external on each side correspond with the two external stripes of the young of the *C. tessellatus*. On the nape the series lose their regularity, and on the nape region they are more frequently transverse. The hind legs are olivaceous, marked with numerous irregular oval yellow spots. No stripe on the posterior face of the femur. Head without spots or stripes. Gular region dark olive; thorax blackish; belly yellowish, the scales with black bases. Tail olive with scales above yellowish at the base, brownish beyond; below brown except the basal fourth, which is yellowish with black spots on most of the scales. Posterior limbs with oval yellowish spots on an olivaceous ground. Femur not striped behind.

This species resembles the *C. maximus* in the increased number of its femoral pores and femoral and brachial scales, but is distinguished by its much longer hind leg, spotted coloration and much smaller size.

Cnemidophorus tessellatus variolosus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3066	1	Parras Coahuila	Lieutenant Couch, U. S. A.	Alcoholic.

CNEMIDOPHORUS OCTOLINEATUS Baird.

Cnemidophorus octolineatus BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 255; U. S. Mex. Bound. Surv., II, 1859, Pt. 2, Rept., p. 10.—COPE, Check List Batr., Rept. N. Amer., 1875, p. 45.

Interparietal plate subquadrate, about equal parietals; both bounded posteriorly by small scuta. Superior labials five to below middle of orbit; the last wedge-shaped. Infralabials five, first pair in contact throughout their length. Brachial plates in five rows, continuous with the three rows of antebrachials. Femorals in six, tibials in three rows. Femoral pores, 17. Anal plates three large ones, two posteriorly and one in front, and all surrounded, except behind, by eight or nine smaller plates. Dorsal and lateral scales oval, the long diameter anteroposterior, and arranged in transverse rows. Surface smooth. Larger scales of collar not interrupted at middle; mesoptychial scales little reduced. Extended hind leg reaching to half way between shoulder and auditory meatus.

Measurements.—Size small. Total length, 184 mm.; length to angle of mandible, 15 mm.; to edge of collar, 19 mm.; to vent, 60 mm.; to axilla, 25 mm.; of fore leg, 20 mm.; of fore foot, 9 mm.; of hind leg, 38 mm.; of hind foot, 20 mm.

The general color in spirits is bluish olive, darker above and lighter below. This is traversed on the dorsal region by four pale, narrow

stripes of the same tint on each side. The external three of these are homologous with those of the *C. tessellatus perplexus* and the *C. sexlineatus*, and the additional five are median and equidistant from the other stripes and from each other. There are no spots on any part of the body, head, tail, or limbs.

This species differs from the young specimens of the *C. tessellatus* of equal size, in the small number of its femoral pores, and in the absence of spots on the hind limbs and sides, as well as in the additional pair of median longitudinal stripes. The single known specimen is apparently adult, and is about equal in size to a half-grown *C. tessellatus*, and smaller than the *C. variolosus*.

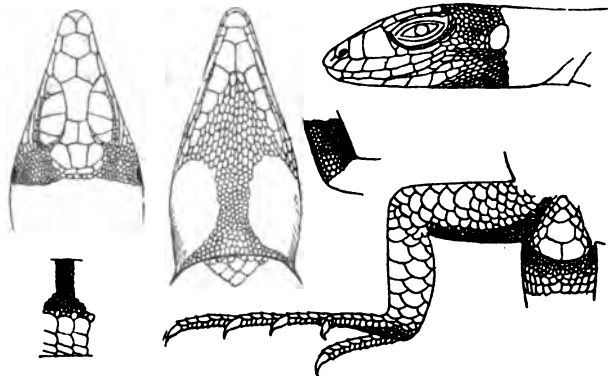


Fig. 113.

CNEMIDOPHORUS OCTOLINEATUS BAIRD.

× 1.66.

Nuevo Leon, Mexico.

Cat. No. 3009, U.S.N.M.

Cnemidophorus octolineatus Baird.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3009	1	Pesqueria Grande, Nuevo Leon, Mexico.	Lieutenant Couch, U. S. A.	Alcoholic.

CNEMIDOPHORUS INORNATUS Baird.

Cnemidophorus inornatus BAIRD, Proc. Acad. Nat. Sci. Phila., 1858 (December), p. 255; Rept. U. S. Mex. Bound. Sur., II, 1859, Pt. 2, Rept., p. 10.—COPE, Check List Batr., Rept. N. Amer., 1875, p. 45.

Parietal and interparietal plates subequal; posterior supraorbital minute. Infralabials five, the last minute, the first pair in contact throughout. Brachial scales in six rows: femorals in only four or five. Femoral pores, 16-17. Hind limb extended reaches meatus auditorius. Scales round, projecting freely upwards posteriorly on the middle line, so as to produce a rough surface.

Measurements.—Total length, 190 mm.; length to angle of lower jaw, 15 mm.; to collar, 20 mm.; to axilla, 24 mm.; to vent, 56 mm.; of fore limb, 18 mm.; of fore foot, 9 mm.; of hind leg, 39 mm. of hind foot, 20 mm.

Color uniform dark olivaceous above; pale olivaceous below. No spots nor stripes.

This species is distinguished by a combination of characters. The rough scales are peculiar to it, and it is the only species known to me in which the rows of brachial plates exceed the femoral in number. It is the smallest species, and yet shows no indication of stripes.

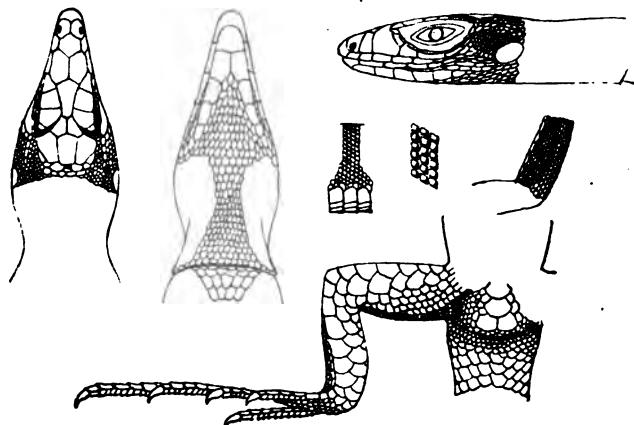


Fig. 114.

CNEMIDOPHORUS INORNATUS BAIRD.

× 2.

Nuevo Leon, Mexico.

Cat. No. 3032, U.S.N.M.

Cnemidophorus inornatus Baird.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3032	2	Pesqueria Grande, Nuevo Leon, Mexico.	Lieutenant Couch	Alcoholic.

CNEMIDOPHORUS SEPTEMVITTATUS Cope.

Cnemidophorus septemvittatus COPE, Trans. Amer. Phil. Soc., 1893, p. 40, pl. IX, fig. 8.

Scales of collar large, in three or four transverse rows, the largest row on the edge; scales of mesopterygium small, flat, those of gular region larger. Head narrower than in any other species, the first and second supraorbital plates longer than wide, the fourth well developed. Interparietal plate twice as long as wide, considerably narrower than the parietals; both bounded posteriorly by some small plates. Loreal much longer than postnasal; no frenoorbital. Infralabials, six on each

side, the first pair in contact throughout. Dorsal scales coarse, round, projecting upward at their posterior border. Brachial scales in six rows, antebrachial in three. Femorals in eight rows, tibials in three. Femoral pores, 16-18. Anal plates only three, separated from vent by a wide granular space, and surrounded anteriorly and laterally by one row of small flat scales. Legs rather short, hind foot reaching to half way between humerus and auricular meatus.

Measurements.—Size above medium for the genus. Length of head

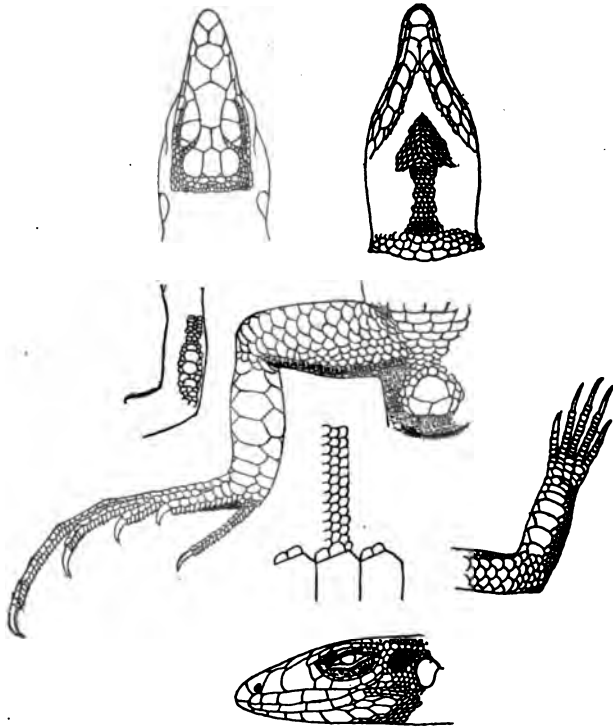


Fig. 115.

CNEMIDOPHORUS SEPTEMVITTATUS COPE.

=1.

California.

Cat. No. 7872, U.S.N.M.

and body to vent (tail injured), 110 mm.; length of head to angle of mandible, 26 mm.; length to collar, 32 mm.; length to axilla, 42 mm.; length of fore leg, 31 mm.; length of fore foot, 25 mm.; length of posterior leg, 71 mm.; length of hind foot, 35 mm.

Color above, light olivaceous brown, traversed by seven longitudinal broad, black stripes, three on each side and one on the middle line. On the lumbar region the median band disappears, and the pale intervals are wider than the black ones; anteriorly the pale ground assumes its normal relation of stripes on a black ground. The inferior begins at

the orbit and passes over the tympanum; the next begins above the anterior border of the orbit and marks the external borders of the supra-orbital plates. The next issues from a parietal plate. Anteriorly the black interspaces have a few small spots; posteriorly they become undulate through lateral emarginations, and more posteriorly the first and second stripes are broken up into quadrate spots, the third remaining unbroken. The hind legs are very indistinctly marbled on an olive-gray ground. The fore legs are coarsely reticulated with black on an olive ground. The lateral dark stripes extend to the orbit, and there is a blackish shade on the side of the muzzle, just below the canthus rostralis. Lower surfaces everywhere yellowish unspotted, except a few black specks on the inferior labials and sides of the gular region. Tail olive above, yellowish below.

This species belongs to the *C. sexlineatus* series, as indicated by the scales of its collar, but it has the coarse scales of the *C. tessellatus*. Its six infralabial scales are found only in the former series. Its coloration resembles in some degree the stage of the *C. tessellatus tessellatus*, called by Baird and Girard *C. tigris*, but it has seven stripes instead of four, and the lateral stripes are broken up and not the median, as is the case in the latter. It also differs from the latter in the marking of the fore leg and nearly uniform coloration of the hind leg, the reverse being the case in the *C. tessellatus*. The striping of the head is also not seen in the latter. The head is also narrower in proportion to its length.

This, perhaps the handsomest species of the genus, is represented in the collection by an adult female only.

Cnemidophorus septemvittatus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2872	1	Eldorado County, California.	Dr. C. C. Boyle.....	Alcoholic.

CNEMIDOPHORUS SEXLINEATUS Linnæus.

Cnemidophorus sexlineatus GRAY, Cat. Liz. Brit. Mus., 1845, p. 21.—DUMÉRIL and BIBRON, Erp. Gén., V, 839, p. 131.—DUMÉRIL, Cat. Méth. Rept., 1851, p. 176.—COPE, Check-list N. Amer. Batr. Rept., 1875; Trans. Amer. Phil. Soc., 1892, p. 42, pl. ix, fig. 7.—BOCOURT, Miss. Sci. Mex., Rept., 1874, p. 273, pl. xx C, fig. 11.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 364.

Lacerta sexlineata LINNÆUS, Syst. Nat., 12th ed., I, 1766, p. 364.—GMELIN, Syst. Nat., 1788, p. 1074.—LATREILLE, Hist. Nat. Rept., I, 1801, p. 242.—DAUDIN, Hist. Rept., III, 1802-1803, p. 183.—HARLAN, Journ. Acad. Nat. Sci. Phila., VI, 1827, p. 18.

Ameiva sexlineata HOLBROOK, N. Amer. Herpt., 1st ed., I, 1838, p. 63, pl. vi; 2d ed., 1842, p. 109, pl. xv.

Cnemidophorus sexlineatus DUMÉRIL and BIBRON, Erp. Gén., V, 1839, p. 131.—AUG. DUMÉRIL, Cat. Col. Rept., I, 1851, p. 116.

Scales of collar large, in few rows, the largest forming the lower. Scales of the upper surfaces minute, not larger than .33 mm. in diame-

ter. Four supraorbital plates, the posterior small. Frontoparietals larger than parietals, with transverse anterior border. Interparietal longer than wide. Loreal as high as or higher than long in consequence of the rather short, elevated muzzle. Superior laterals five to below orbit, the last acuminate posteriorly. Larger gular scales beginning rather abruptly in a line which extends entirely across the throat. Brachial scales in five or six longitudinal rows, very rarely in seven;

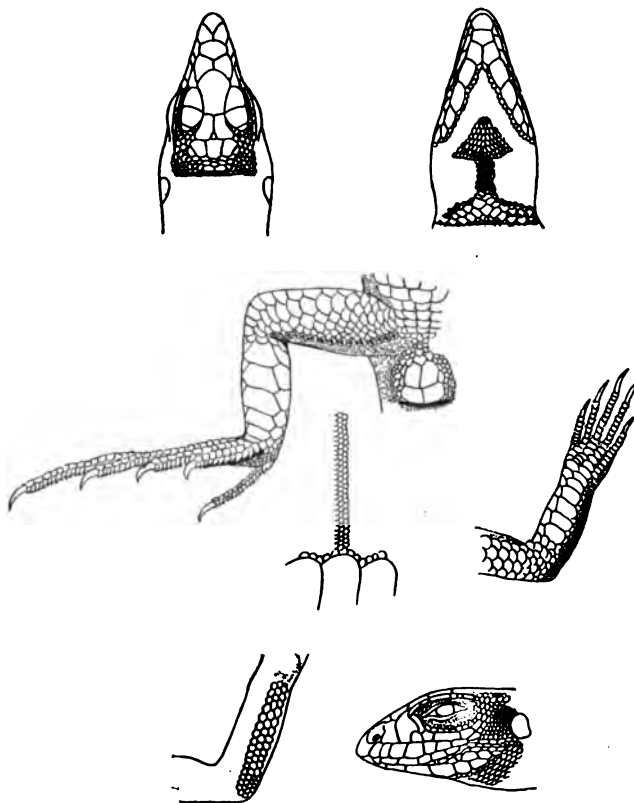


Fig. 116.

CNEMIDOPHORUS SEXLINEATUS LINNÆUS.

=1.

Virginia.

Cat. No. 4878, U.S.N.M.

antebrachials in three rows. Large postantebrachials absent. Femorals in six rows, less frequently in seven; tibials in three rows. Femoral pores varying in number from 15 to 17. Principal anal scuta three—two marginal, the third anterior. The longest toe of the extended hind leg reaches to the anterior border of the meatus auditorius.

The head is rather short, compressed at the sides, and rounded at the snout in profile. The front plate is large and pentagonal, broad before and narrower behind. On each side there are two large, irregular

rhomboidal superior orbital plates, which supply the place of bony orbits, in front of which is a smaller plate, reaching to the fronto-nasal, and a still smaller plate behind them. On the outer margin of these are two series of small scales, beyond which is a row of seven narrow, elongated plates that form the superior margin of the orbit; the fronto-nasal plates are regularly pentagonal, broadest externally; the interfrontonasal broad transversely, rounded before and acute-angled behind; the nasals are quadrilateral, rather elongated, meeting in the mesial line above; the opening for the nostril is in its most inferior part, near the postnasal plate, which is triangular, with its basis below and apex above and prolonged. The frontoparietal, interparietal, and parietal plates are nearly all of the same size; the two fronto parietals are truncate in front. The interparietal is longer than wide and parallelogramic in form; with the parietals, it is bounded posteriorly by small plates, of which there are several series behind. There are three inferior orbital plates, placed nearly in a row; the central is quadrilateral, elongated, and narrow; the two others are very small. There is a single loreal plate, pentagonal and large, ascending to the plane of the forehead. The upper jaw is covered at its inferior margin with a row of five small, square, labial plates; the anterior only is trigonal and smallest. There are two series of plates to the lower jaw, the inferior largest, and consisting of five plates, of which those of the anterior pair are in contact with each other. The eyes are rather small, with a dusky pupil and a golden iris; the inner margins of the eyelids are bordered with a very narrow band of bright yellow; the membrane of the tympanum is apparent and of a palish white color; the entrance to it is round and of large size. The body is elongated and covered on the back and sides with minute scales, which measure .33 mm. in diameter in the adult. The scales of the abdomen are large and arranged in eight rows, of which those nearest the middle are largest. The tail is very long, perfectly cylindrical, and covered with verticillated scales, carinated above and smooth below. The vent is transverse and has in front three large scales, placed in a triangle, two posterior to the other and with smaller scales behind.

The anterior extremities are well developed, rounded, covered above at the shoulder with five to six rows of large scales, and with two rows still larger and a smaller row on the front of the forearm; their inferior surface is granulated. The fingers are scaled to the root of the nails, which are short, small, delicate, and curved. The posterior extremities are twice the size of the anterior; the thigh above is covered with granulations, and below with six or seven rows of large scales; the leg is covered like the thigh, but there are three rows of still larger scales below; the tarsus is granulated on its inferior, and has two rows of scales on its superior surface. The fourth toe is very long, and the first and fifth are subequal; all are armed with short, small, curved claws. There is a range of from 15 to 17 femoral pores under the thigh.

The head is dusky brown; the upper jaw bluish white; the lower nearly of a silver-white color. Along the back extends, from the occiput to the tail, a purple or brownish band, on each side of which are three yellow or golden longitudinal lines; of these, the superior is the palest and shortest; it begins at the parietal plate and terminates at the tail; the other lines are much longer and brighter, the upper one beginning above the orbit and extending to the middle of the tail; the lower line begins below the eye and runs above the tympanum, along the flanks to the anterior part of the thigh; a shorter and more indistinct line extends from the angle of the mouth, below the tympanum, to the shoulder; the spaces between these longitudinal bands are jet-black. The throat is silver-white, and the abdomen of a shining bluish-white color. The upper surface of the tail is nearly similar in color to the back, but appears much rougher from the verticillated scales; its inferior surface is whitish. There are two longitudinal lines on each side of the tail; the superior one is continuous with the central yellow longitudinal line of the back, and terminates about the middle of the tail; the inferior line is paler, it begins back of the thigh, runs nearly to the extremity of the tail, and seems to divide the upper or darker portion from the inferior or whiter part.

The anterior as well as the posterior extremities are brownish above and bluish-white below, and along the posterior part of the thigh runs a whitish line continuous with the inferior longitudinal line of the tail, bordered by darker above and below.

Measurements.—A specimen from Piney Point, Maryland (Cat. No. 9256). Total length, 235 mm.; length to angle of mandible, 18 mm.; length to collar, 21 mm.; length to axilla, 27 mm.; length to vent, 70 mm.; length of forelimb, 24 mm.; length of forefoot, 9 mm.; length of hind leg, 50 mm.; length of hind foot, 28 mm.; width of head at front of tympana, 10 mm.

This is one of the smallest species, and it retains the young type of coloration everywhere. It is also distinguished by its short and high muzzle and the absence of postantebrachial scales. It covers the Austroriparian region of the Nearctic realm and the Eastern as far as the range of the Carolinian district, extending to Maryland and Delaware, but not New Jersey. In the Central region it reaches north to the Sand Hills of the Loup Fork River of Nebraska. The only difficulty in defining it is found in specimens from the region which is also inhabited by the *C. gularis*. In Texas, New Mexico, and Arizona the species merge into each other. If we refer specimens with fewer than eighteen femoral pores and no spots between the stripes or on the sides to the *C. sexlineatus*, we find that in certain specimens from the region in question the postantebrachial scales are larger than in eastern specimens, though not so large as in the true *C. gularis*. Such are Cat. Nos. 4860, 8459, 11839, and 14787. In another series the postantebrachial scales are equally intermediate in size and there are no spots,

but the femoral pores are in enlarged numbers. Such are Cat. Nos. 4788, 11885, 14249, and 15607. From these we pass easily to the true *C. s. gularis*, with large postantebrachials and spotted spaces.

Cnemidophorus sexlineatus Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8381	30	Kinston, North Carolina.		Welsher and Quinn	Alcoholic.
8459	1	Plaza del Alcalde, New Mexico.	Aug. —, 1874	Dr. H. C. Yarrow	do.
4788	1	Santa Fé, New Mexico.		Howard	do.
8534	1	New Mexico.	Oct. —, 1874	Dr. O. Loew	do.
8458	1	Abiquiu, New Mexico	Sept. —, 1874	G. Thompson	do.
4512	6	Indian Key, Florida		G. Wurdemann	do.
9701	1	Micanopy, Florida			do.
5323	2	Pensacola, Florida		Dr. R. W. Jeffrey	do.
5112	2	do			do.
5103	1	Eutaw, Alabama		Prof. A. Winchell	do.
3005	20	Fort Smith, Arkansas		Lieut. A. W. Whipple, U. S. A.	do.
4860	2	Pecos River, Texas		J. K. Townsend	do.
3071	8	New Braunfels, Texas			do.
8533	1	Laredo, Texas			do.
4752	1	Gilmer, Texas		J. N. Glasco	do.
5085	1	New Orleans, Louisiana		N. O. Academy	do.
4873	1	Norfolk, Virginia		Lieut. Couch, U. S. A.	do.
4878	1	do			do.
5105	1	Prince George's, Maryland			do.
5110	2	Society Hill, South Carolina.		M. A. Curtis	do.
5106	8	Rome County, Tennessee		Prof. J. H. Mitchell	do.
8531	1	Camp Lowell, Arizona	Oct. —, 1874	J. H. Rutter	do.
9122	2	Milledgeville, Georgia	May —, 1875	Fred. Mather	do.
9091	2	Montgomery, Alabama	July 12, 1876	Kumlien and Bean	do.
9093	1	Milledgeville, Georgia	June 4, 1877	do	do.
9246	2	(?)			do.
5090	1	Republican Fork, Kansas		Dr. W. A. Hammond, U. S. A.	do.
9245	1	Micanopy, Florida		Dr. T. H. Bean	do.
14787		Plataan Creek, Colorado		T. D. A. Cockerell	
15336		Key West, Florida.		U. S. Fish Commission	
15544-6		Cook County, Texas		G. H. Ragdale	
16695		St. Marys, Georgia		C. F. Batchelder	
17842-46		Key West, Florida		U. S. Fish Commission	
20000		Lake Harrie, Florida		do	
21255		Long Pine, Nebraska		do	
22134		St. Louis, Missouri		Julius Hurter	
22177		Bellevue, Iowa.		Ed. A. Hanks	
22178-80		Point Lookout, Maryland		R. Ridgway	
10484	1	Galveston, Texas		Ensign M. I. Wood, U. S. N.	
11839	1	Old Fort Cobb, California		E. Palmer	
11841	1	do		do	
11885	4	Camp Whipple, Arizona		Dr. E. Cones	
11955	1	Fort Davis, Texas		Wm. Fred. von Manteuffel	
14249	22	Chihuahua, Mexico		E. Wilkinson	
14787	1	Plataan Creek, Colorado		T. D. A. Cockerell	
15606	1	Savannah, Georgia?		?	
15607	1	Arizona		Dr. E. Coues	
22177	1	Bellevue, Iowa		Ed. A. Hanks	
15336		Key West, Florida		U. S. Fish Commission	
16695	1	St. Marys, Georgia		C. F. Batchelder	
17842-6	5	Key West, Florida		U. S. Fish Commission	
20000	1	Lake Harrie, Florida		do	
21255	1	Long Pine, Nebraska		do	
21184	1	St. Louis, Missouri		Julius Hurter	
22178-80	3	Point Lookout, Maryland		R. Ridgway	

Two specimens from Florida (one of them from Key West, Cat. No. 15336) display the anomaly of a fusion of the three large anal plates into one. All other Florida specimens are normal.

It is seen by the above table that the most northwestern locality for this form is the Sand Hills of the Loup Fork River of Nebraska (Cat. No. 3144). Next to it in the same region is Cat. No. 5090 from the Republican River, in northern Kansas.

CNEMIDOPHORUS GRAHAMII Baird and Girard.

Cnemidophorus grahamii BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 128.

This species is represented by two forms, which differ, so far as appears, in coloration only. The one is found in western Texas, the other in southern and Lower California. They differ as follows:

Eight rows of black spots above and on the sides; belly and throat little or not black spotted *C. g. grahamii*
 Nine rows of black spots above; belly and gular region black spotted. *C. g. stejnegerii*

CNEMIDOPHORUS GRAHAMII GRAHAMII Baird and Girard.

Cnemidophorus grahamii BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 128.—BAIRD, U. S. Mexican Bound. Surv., II, 1859, p. 10, pl. XXXII, figs. 1-6.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 45; Trans. Amer. Phil. Soc., 1892, p. 642.

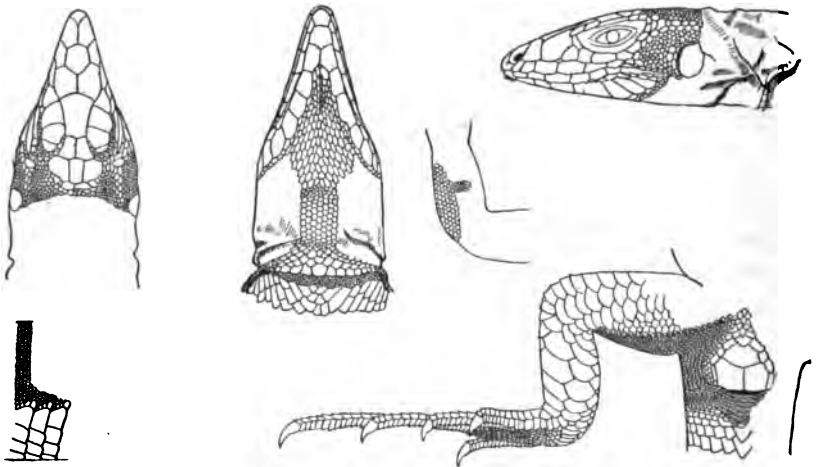


Fig. 117.

CNEMIDOPHORUS GRAHAMII GRAHAMII BAIRD AND GIRARD.

=1.

Western Texas.

Cat. No. 3046, U.S.N.M.

Loreal plate plus frenoocular a little longer than high. Gular scales smaller than those of the collar, extending across the throat and abruptly bounded posteriorly. Brachial scales in seven, antebrachials in three rows. Postantebrachials small, as in *C. sexlineatus sexlineatus*. Femorals in eight rows, tibials in three. Femoral pores 21-2. Three anal scuta, two marginal. Longest toe of extended hind limb reaching anterior border of meatus auditorius externus. First and fifth toes extending to about the same distance on the foot.

Traces of four of the original six stripes are seen on the neck pro-

ceeding from the parietal and superciliary scales. At the scapular region the black spaces are broken into square spots, forming three longitudinal series, one median. The other black spaces form transverse bars on the sides, and they are sometimes united above, forming inverted V's. They tend to fuse with the dorsal series posteriorly, and in one of the types this is completed, thus forming irregular black cross bars. The superior surfaces of both limbs are black, with large yellow spots. Superior dark band extending as shades on the supra-orbital plates. A pale light stripe from orbit over meatus auditorius. Gular region unspotted. Black spots covering, or on the base only of, some of the lateral abdominal scuta. Tail with two or three rows of dark spots on an olive ground above; below unspotted. Posterior face of femur with yellow spots separated by vertical dark lines.

But two specimens of this form are contained in the U. S. National Museum, the original types of Baird and Girard. In one of these there are six infralabial scuta on both sides, and in the other there are but five on one side. On the other side there are spaces for six, but two are fused into one, so that I believe that six is the normal number for this subspecies as it is for the others. Two other specimens were obtained by Mr. W. L. Black, of the geological survey of Texas, at Tule Canyon on the Staked Plain. They differ only from the presence of a median dorsal zigzag light stripe.

Baird's figure represents this handsome form very well.

Cnemidophorus grahamii grahamii Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Character of specimen.
3046	2	El Paso to San Antonio, Texas.	J. H. Clark.....	Alcoholic.

CNEMIDOPHORUS GRAHAMII STEJNEGERII Van Denburgh.

Cnemidophorus stejnegeri VAN DENBURGH, Proc. Cal. Acad. Sci., IV, 1894, p. 300.

The following description is by Van Denburgh:

Adult male (Type No. 1861, Leland Stanford Junior University Museum, collected by J. M. Stowell between San Rafael and Ensenada, Lower California, June 8, 1893). Nostril anterior to nasal suture; 3 parietals, 2 frontoparietals, 4 supraoculars, 6 superciliaries; nasal not reaching second superior labial; postnasal in contact with both first and second superior labials. Posterior gular scales rather large, abruptly separated from the very large and convex anterior gulars. Plates of collar very large, but smaller along its edge. Ventral plates in eight longitudinal rows. Back, neck, and upper surfaces of limbs covered with very small, smooth, convex granules. Five rows of brachial plates; three rows of antebrachials; no post-antebrachial plates. Femoral rows in seven rows. Twenty and twenty-two femoral pores. Scales on tail large, oblique, slightly pointed, and with strong diagonal keels.

Color above yellowish-brown posteriorly, becoming grayish toward head, paler on sides, with nine longitudinal rows of very irregular black spots. Upper surface of limbs similarly marked. Black markings on sides of head and neck and on gular region large and well defined. Lower surfaces creamy white, maculated with black.

Length, 343 mm.; head, 26 mm.; hind leg, 70 mm.; fore leg, 37 mm.; tail, 252 mm.

Habitat.—Northwestern Lower California and San Diego County, California.

Twelve other specimens collected by Mr. Stowell at the type locality at San Telmo and in the foothills of the San Pedro Martir Mountains, Lower California, do not differ from the type in any important particular. The number of femoral pores varies from nineteen to twenty-five, of brachial plates from four to five rows, and of antebrachials from two to three rows.

Forty-one specimens from San Diego County, California (collected in Santa Ysabel, Clogstons, and Hemet valleys; at San Jacinto and in the Julian Mountains, by Messrs. Hyatt and Stoddard), are essentially like those from Lower California but average slightly paler in general coloration.

Cnemidophori from northern Lower California and from San Diego County, California, present much the general appearance of *C. tigris undulatus* (Hallowell). They differ from that form in having the dorsal scales smaller, the gular scales and the scales on the collar larger, and in the presence of large and well-defined black spots on the gular region. From *C. tigris* B. & G. they differ by character of the scales as above indicated, by the absence of the slate-colored suffusion on the gular regions, and by the well-defined black markings on the side of the head.

The form does not appear to be very different from the *C. grahamii grahamii*, but the collar scales are somewhat differently arranged, and the color is somewhat different. Mr. Van Denburgh has shown the characters to be constant in a large number of individuals.

Cnemidophorus grahamii stejnegerii Van Denburgh.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
21512-6	5	San Fernando, Lower California.	A. W. Anthony.....	Alcoholic.

CNEMIDOPHORUS GULARIS Baird and Girard.

Cnemidophorus gularis BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 128.—BAIRD, U. S. Mex. Bound. Surv., Reptiles, pl. xxxiv, figs. 1-6.—COPE, Trans. Amer. Phil. Soc., 1892, p. 43.

Cnemidophorus guttatus HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1854, p. 192.

This species is allied to the *C. sexlineatus*, but is distinguished by the presence of post-antebrachial plates, the more numerous femoral pores and the longer muzzle. It is very variable as to size and color, but the dark spaces between the light stripes are always marked, interrupted or completely broken up by light spots or spaces, except in the young. The color variations are similar to those already mentioned under the head of the *C. tessellatus*, but they are more numerous. Specimens from western Texas come nearest in character to the *C. sexlineatus*. It takes the place of that species throughout Mexico, also replacing the *C. tessellatus* in the drier parts of that country. Besides the characters already cited, this species differs from the *C. tessellatus* in its finer scales. These measure from .25 to .33 mm. in diameter, while those of the *C. tessellatus* measure .5 mm.; but this character does not always hold good.

The subspecies of the *Cnemidophorus gularis* differ as follows:

Stripes persistent, narrow, defined; no black spots; femoral scales in 6-8 rows; hind legs yellow spotted, and with a stripe behind; smaller..... *C. g. gularis*.

Stripes persistent, wide, ragged; spots in interspaces irregular; parietal plate very narrow; muzzle elongate; legs neither spotted nor striped; large; 8 rows femoral scales; 6 infralabials *C. g. angusticeps*.

Stripes vanishing, their interspace with black crossbars ultimately joining crosswise; femoral scales 8-10; hind legs spotted; infralabials 5-6; large.

C. g. mariarum.

Stripes broken up into rows of spots; interspaces with yellow spots; hind legs with or without yellow spots; no posterior femoral stripe; a frenoöbital; 5-6 infralabials; large..... *C. g. communis*.

Light stripes traceable anteriorly only; black bands broken up into transverse spots by orange spots on body; hind limbs pale spotted; femoral scales 7-8 rows; infralabials generally 6; medium..... *C. g. scalaris*.

Anal plates 3-4; femorals in 8-9 rows; femoral pores 21; 6 infralabials; large scales of collar equal; stripes posteriorly obsolete; interspaces in front spotted; medium.

C. g. sericeus.

No light stripes; olivaceous with three rows of black spots on each side on anterior fourth of body; femorals 8; infralabials 6; muzzle elongate; limbs unspotted; medium *C. g. semifasciatus*.

No light stripes; olivaceous, with black bars on sides, which cross back on lumbar region; rump and hind legs yellow-spotted; femoral scales 8-rowed; infralabials 6; muzzle elongate; medium..... *C. g. costatus*.

The geographical distribution of the subspecies is as follows:

C. g. gularis, Sonoran region.

C. g. angusticeps, Yucatan.

C. g. mariarum, Tres Marias Islands.

C. g. communis, southwestern Mexico.

C. g. scalaris, Chihuahua and southward.

C. g. semifasciatus, Coahuila, Mexico.

C. g. costatus, Mexico; locality unknown.

These forms may be compared with those of the *C. tessellatus* in color characters as follows. I have already remarked¹ that this series of variations follows quite closely those pointed out by European authors to exist in the *Lacerta muralis*. These have been made the subjects of especial study by Professor Eimer, of Tübingen, from whose paper² I extract the following points of comparison:

	<i>Onemidophorus tessellatus</i> .	<i>Onemidophorus gularis</i> .	Other <i>Onemidophori</i> .	<i>Lacerta muralis</i> .
1. Longitudinally striped.....	<i>C. t. perplexus</i>	.....	<i>C. octolineatus</i> .	<i>L. m. campestris</i> .
2. Dark interspaces pale-spotted....	<i>C. t. tessellatus a.</i>	<i>C. g. gularis a.</i>	<i>C. seplineatus</i> . <i>C. labialis</i> <i>C. septemvittatus</i> .	
3. Dark interspaces divided by light color.	<i>C. t. tessellatus β.</i>	<i>C. g. scalaris a.</i>	<i>C. grahamii</i> ...	<i>L. m. albiventris</i> . <i>L. m. striatopunctata</i> . <i>L. m. reticulata</i> .
4. Dark spots confluent transversely, forming crossbars.	<i>C. t. tessellatus γ.</i>	<i>C. g. scalaris β.</i>	.....	<i>L. m. tigris</i> . <i>L. m. punctulata</i> .
5. Light spots not confluent; light stripes broken up; pattern reticulated.	<i>C. t. melanostethus</i> .	<i>C. g. costatus</i> ...	<i>C. variolatus</i> ..	
6. Dark spots separate and on a brown ground.	<i>C. t. rubidus</i> ...	<i>C. g. semifasciatus</i>.	.....	

¹American Naturalist, December, 1891.

²Archiv. f. Naturg., 1881, p. 239.

There are some color forms in the *Lacerta muralis* which are not repeated in the North American *Cnemidophori*, particularly those which result in a strong contrast between the dorsal colors as a whole and the darker lateral colors as a band. The color variety, No. 6, of the *Cnemidophori* is not reported by Eimer as occurring in the *Lacerta muralis*.

CNEMIDOPHORUS GULARIS GULARIS Baird and Girard.

Cnemidophorus gularis BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., VI, 1852, p. 128 (Indianola to San Pedro River); Marcy's Explor., Red River, 1854, p. 226, pl. x, figs. 1-4.—HALLOWELL, Proc. Acad. Nat. Sci. Phila., VIII, 1856, p. 239.—BAIRD, U. S. and Mex. Bound. Surv., Rept., 1859, pl. xxxiv, figs. 1-6. *Cnemidophorus guttatus* HALLOWELL, Proc. Acad. Nat. Sci. Phila., VII, 1854, p. 192; Texas. (Male.)

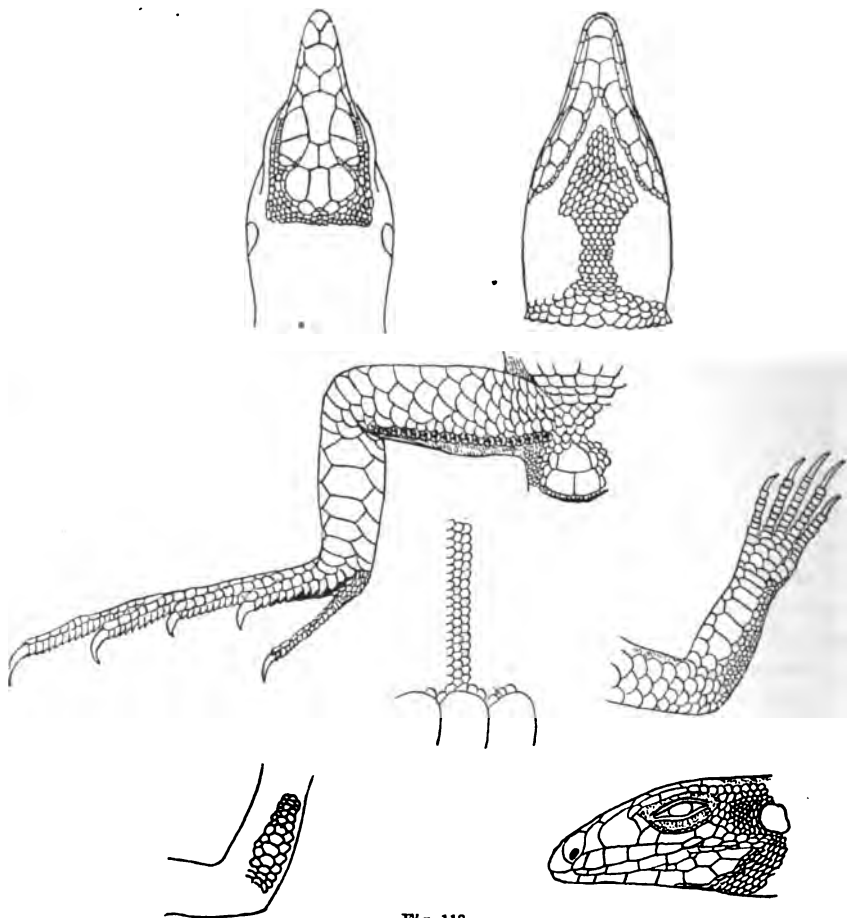


Fig. 118.

CNEMIDOPHORUS GULARIS GULARIS BAIRD AND GIRARD.

= 1.

Cat. No. 3039, U.S.N.M.

The characters of this subspecies have been already pointed out. The elongate muzzle, with the longer postnasal and frenal plates, dis-

tinguish it from the *C. sexlineatus*, while the six longitudinal stripes on a dark ground have the same origins and terminations as in that species. The only difference in the squamation is seen in the presence of one or two rows of large scutes on the posterior face of the forearm. Accompanying this character is a larger number of femoral pores, which range from eighteen to twenty-two, averaging about twenty, as against sixteen and seventeen of the eastern form. Specimens having such characters generally have a single series of light spots in the dark spaces between the longitudinal stripes, which are not confluent with the light stripes, and which do not therefore break up the dark stripes into spots. The majority of such specimens have light spots on the sides below the inferior stripe. In some smaller specimens, presumably females and young, all the spots are wanting. In this subspecies the frenoöcular plate occasionally appears. The general proportions are as in *C. s. sexlineatus*, the longest toe of the extended hind leg reaching to the front of the meatus auditorius. The size of adults exceeds a little that of the eastern form, a specimen from Arizona (Cat. No. 5020) measuring 100 mm. from the end of the snout to the vent. This is, however, larger than the average.

This form is found in western Texas, New Mexico, and Arizona, and in Mexico as far south as Chihuahua and Monterey.

Certain specimens agree in all respects with this subspecies, except in the possession of a smaller number of femoral pores. Such are Cat. Nos. 3055, 3022, 3006, 3010, 3071, 1871, and 9247. Cat. No. 3022 includes five specimens, which present the typical characters of the subspecies, but add a peculiarity, in which they all agree, namely, the possession of six infralabial plates, thus approaching the *C. grahamii*. The males have the thoracic region black and the abdominal scales more or less margined with the same color. The same color character appears in a few other specimens, and in Cat. No. 15604 there are six infralabials on one side.

Cnemidophorus gularis gularis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.
8761	2	Camp Grant, Arizona.....	Expl. west of 100th meridian, Jas. H. Rutter.
3001	.....	San Antonio, Texas	Expl. west of 100th meridian, Lieutenant Whipple.
8162	.....	Arizona	
9247	1	San Antonio, Texas	S. W. Woodhouse.
3056	1	El Paso, Texas	Mr. Clark.
3039	.....	Near 32° Long.....	Captain Pope.
13969	1	Tucson, Arizona.....	E. W. Nelson.
15604	1	Monterey, Mexico.....	Lieutenant Couch.
3006	.....	Guapaso, Monterey, Nuevo Leon.....	do.
3010	.....	Eagle Pass	A. Schott.
3071	.....	No locality	No donor.
3022	5	San Pedro, Rio Grande	Col. J. D. Graham.
3055	12	Matamoras, Tamaulipas	Lieutenant Couch.
5020	2	Arizona	Dr. B. L. D. Irwin.
17202-7	6	Tucson, Arizona.....	P. L. Jouy.
17209	1	do.....	do.
.....	.....	Fort Huachuca	Dr. T. Wilcox, U. S. A.
15604	1	Monterey, Mexico	Lieutenant Couch.
16762-3	2	Fort Wingate, New Mexico.....	Dr. R. W. Shufeldt.

Cnemidophorus gularis gularis Baird and Girard—Continued.

Catalogue No.	Number of specimens.	Locality.	From whom received.
17074-5	2	Cameron County, Texas.....	C. K. Worthen.
17137	1	Silver City, Granite County, New Mexico	M. Metcalf.
17140-43	4	Nogales, Arizona.....	P. L. Jouy.
17190-94	5	Town's ranch, near Nogales, Arizona...	do.
17195-201	7	Nogales, Arizona.....	do.
17202-10	9	Tucson, Arizona.....	do.
17210-14	5	Pineto's camp, 3 miles south of Nogales, Sonora, Mexico.	do.
17215	1	Nogales, Arizona.....	do.
21487	1	Hot Springs, Arkansas.....	H. H. and C. S. Brimley.
21498	1	Waco, Texas.....	do.
22078	1	Hot Springs, Arkansas.....	Julius Hurter.
15698	1	Prescott, Arizona.....	Capt. W. L. Carpenter.

This form resembles the *C. s. sexlineatus* more than any other, but always possesses the postantibrachial plates and more numerous femoral pores, which range from eighteen to twenty-two. Occasional specimens are, however, intermediate between the two. Its range is the Sonoran region.

Under this subspecies must be placed four of the series of forms which I described in my paper on the reptilia of Chihuahua as subspecies of the *C. sexlineatus*¹ in the following language, two of the forms (Nos. 5, 6) being the *C. g. scalaris* Cope:

1. Six longitudinal narrow stripes with unspotted interspaces.. *C. g. gularis* (young).
2. Six stripes as above, the dark interspaces with small white spots.. *C. g. gularis verus*.
3. Six stripes as above, wider and very obscure; small obscure spots,
C. g. gularis obsoletus.
4. Six stripes as above, but wider, and the spots enlarged so as to be confluent occasionally with the light stripes.....

"Of the above forms all are numerously represented in the collection. The modification of the color pattern described is not entirely due to age, as some of the largest specimens belong to Nos. 2 and 3. Nevertheless small specimens predominate in the No. 1, and No. 4 presents a good many small specimens." The specimens enumerated are as follows:²

- Subspecies No. 1; Cat. Nos. 14,236-41-49-69; 14,305.
 Subspecies No. 2; Cat. Nos. 14,231-41,305-308.
 Subspecies No. 3; Cat. Nos. 14,231-50-308.
 Subspecies No. 4; Cat. Nos. 14,241-50-302-5.

These forms are not sexual, as several of them include both sexes.

Not having been fully persuaded of the distinction between the *C. tessellatus* and *C. sexlineatus* series, I used the name *C. s. tigris* for a "sixth subspecies" of the above table. The name was, however, misapplied, although the color pattern is identical with that of the *C. tessellatus tigris* Baird and Girard, with the exception that there are traces of six stripes instead of only four. The smaller specimens

¹ Proc. Amer. Phil. Soc., XXIII, 1886, p. 283.

² The numbers are attached to lots, by the recorder, and not to individuals, and are hence sometimes duplicated.

referred to, the *C. s. sexlineatus*, differ from that subspecies in having well-developed postantibrachial scales.

The gradation in the color characters given is complete, so that no subdivision into subspecies can be made. The case is exactly parallel with that of *C. tessellatus tessellatus*, except that there are here no individuals with the stripes entirely obliterated and complete transverse stripes posteriorly. (Such specimens are the *C. g. scalaris*; see below.) The femoral pores are generally eighteen, but some have sixteen, seventeen, and twenty. In eleven of the specimens now before me seven have five infralabials and four have six. These numbers do not coincide with the color types.

Like other members of this genus this subspecies is extremely active in life. They are not easily caught by a single person, and I have spent considerable time in endeavoring to get near them on the staked plains of Texas. They play hide and seek for a time, and then take refuge in the hole of some fossorial mammal.

CNEMIDOPHORUS GULARIS SCALARIS Cope.

Cnemidophorus gularis scalaris COPE, American Naturalist, 1891, p. 1135; Trans. Amer. Phil. Soc., 1892, p. 47, pls. x, fig. 10; xii, figs. I, K.

Cnemidophorus sexlineatus tigris COPE, Proc. Amer. Phil. Soc., 1886, p. 283; not *C. tigris* Baird and Girard.

Muzzle moderately acuminate in adults; frenal plate about as high as long; frenoöcular plate generally wanting. Brachial scales small, in eight rows; antibrachials in three; postantibrachials in two or three rows. Femorals in eight rows. The three large anal plates are bounded by several small plates laterally and in front. Femoral pores nineteen; in one eighteen, and in one seventeen. Longest toe of extended posterior leg reaching to front of auricular meatus. First and fifth toes measuring opposite to each other.

Ground color pale, on the sides posteriorly light rosy orange. The dark color only remains as narrow transverse black stripes which do not cross the middle line, which is occupied by a longitudinal series of spots. This is due to the fact that in the adults the black ground is completely broken up by the transverse extensions of the light stripes, which are quite traceable in the young. In some specimens the black spots do not fuse on the sides into transverse stripes (Cat. No. 14302). All the dark markings fade out on the limbs and sacral region, leaving a gray ground (in alcohol) which is marked with rosy orange spots. The lateral ventral plates and all those of the thorax with the posterior or concealed face of the anterior leg, are black or blackish in the adult.

Measurements (adult; tail injured).—Length to vent, 93 mm.; length to angle of mandible, 25 mm.; length to collar, 29 mm.; length to axilla, 26 mm. Length of anterior limb, 30 mm.; length of fore foot, 14 mm. Length of hind limb, 67 mm.; length of hind foot, 37 mm.

Several specimens of this form are contained in the collection, and they agree closely in all respects. In coloration it is perhaps the most

ornamental of the genus. It is well distinguished from the *C. grahamii* in color characters, as well as in the presence of the well-developed postantebrachial scales. In the *C. gularis* it corresponds exactly in color characters with the *tigris* form of the *C. tessellatus tessellatus*, designated in the plate of colors as D and E.

The only specimens that I have seen taken within the boundaries of the United States are Cat. Nos. 17208 and 17210 from Arizona. Here all

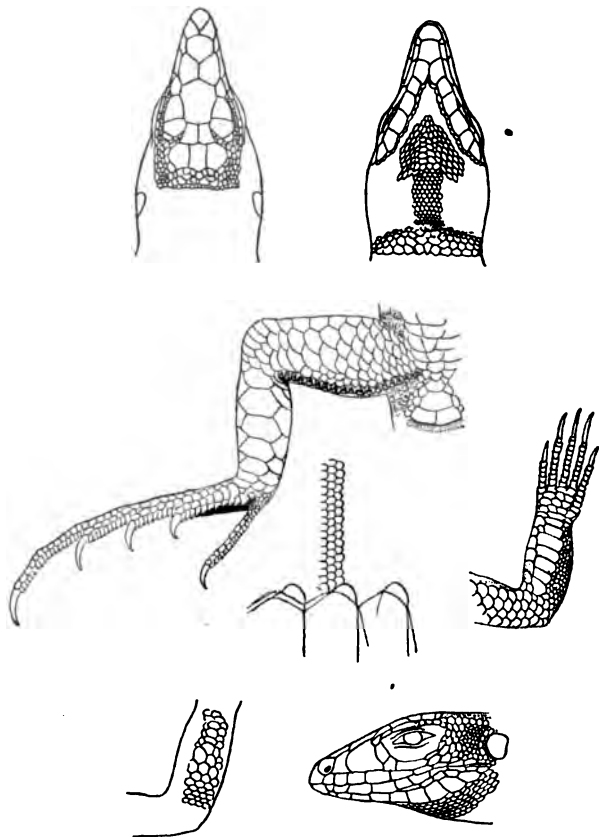


Fig. 119.

CNEMIDOPHORUS GULARIS SCALARIS COPE.

= 1.

Chihuahua.

Cat. No. 8319, U.S.N.M.

the stripes are completely broken up, a trace of the pale ones remaining for a short distance in front of the groin on each side, and on each side of the dorsal median line posteriorly. The black is the ground color, and on the sides it is in more or less distinct transverse stripes. These specimens considerably resemble the *C. g. communis* Cope, but the latter has the light spots much less numerous, especially on the legs, and they are never confluent into transverse bars. The femoral pores are more numerous, ranging from nineteen to twenty-three, while in Cat. No. 17210

they number only fifteen, and in Cat. No. 17208, seventeen. There is no frenoörbital plate in the latter.

Cnemidophorus gularis scalaris Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
8319	5	Mexican plateau south of Chihuahua.	J. Potts	Alcoholic.
14302	2	City of Chihuahua	Edw. Wilkinson	do.
17208	2	Arizona	P. L. Jouy	do.
17210				

CNEMIDOPHORUS GULARIS SERICEUS Cope.

Cnemidophorus gularis sericeus COPE, Trans. Amer. Phil. Soc., XVII, 1892, p. 48, pl. xi, fig. 11.

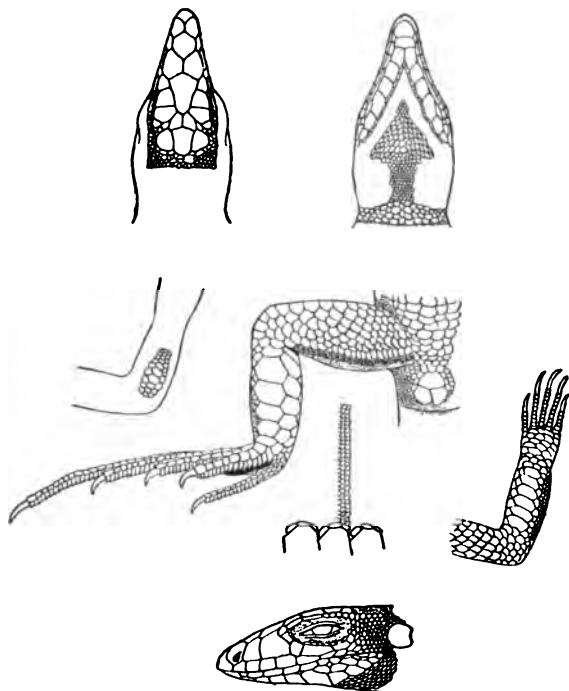


Fig. 120.

CNEMIDOPHORUS GULARIS SERICEUS COPE.

=1.

Southwestern Texas.

Cat. No. 8066, U.S.N.M.

Scales of the collar moderate, subequal, in four or five rows; marginal scales equal to the others. Mesoptychial scales considerably smaller than the gular scales, which are large, and extend from one ramus to the other. Scales of the back rounded, not prominent, small, measuring .33 mm. Supraorbital plates wider than long, except the anterior, and not separated from the frontoparietals by scales. Inter-

parietal large, not twice as long as wide; parietals subtriangular, as wide as the interparietals, but much shorter. Frontoparietals remarkable for their small size and from their terminating each in an angle anteriorly, which receive between them the posterior apex of the frontal. They are smaller than the parietals, which are smaller than in other species. Infralabial plates six on each side, the last one small; the first pair separated at the posterior angle. Brachial scales in six rows; antibrachials in four. Femorals in seven, tibials in three rows. Femoral pores 21. The hind limb extended reaches to the posterior border of the orbit.

Measurements.—Size, medium. Length of head and body (tail injured), 81 mm.; length to angle of mandible, 22 mm.; to edge of collar, 26 mm.; to axilla, 31 mm.; of fore limb, 26 mm.; of fore foot, 14 mm.; of hind leg, 60 mm.; of hind foot, 32 mm.

Ground color above anteriorly black, posteriorly olive. This is marked by six narrow lines of a paler olive, which represent the lines of the *C. sexlineatus*, with an additional median dorsal one. These fade out or become very indistinct on the lumbar and sacral regions. The interspaces, black anteriorly, are marked at first by small olive spots, but these enlarging, break up the black ground into spots, but these fade out on the middle of the length. The superior surfaces of the limbs and tail are olive, the latter unspotted; the hind limbs faintly spotted with paler above and posteriorly, and the forearm reticulated with black posteriorly. The dorsal stripes, except the three median, extend as far as the orbit. Rest of head olivaceous. Lower surface of body bluish olivaceous. Lower surface of head, limbs, and tail, yellow; the first named with a bluish transverse patch across the gular region.

This subspecies has various peculiarities. It differs from the other members of the *C. sexlineatus* series in the larger numbers and more equal size of the scales of the gular fold, approaching in this way the *C. tessellatus*, but not agreeing with it, since the marginal scales are not smaller. It differs from all the species in the small size of the interparietal and parietal plates. Its posterior legs are longer than in any species except the *C. variolosus*. No species has four rows (or three at the narrowest part) of antibrachial scales; the usual number being two to three; and the femorals are more numerous than in the *C. g. gularis*. The coloration is also quite distinctive. But one specimen is known, and that is from southwestern Texas. The discovery of other specimens will determine whether this is or is not a true species. In the obsolescence of the color pattern posteriorly it resembles the *C. g. semifasciatus*, which follows.

Cnemidophorus gularis sericeus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
15650	1	San Diego, Texas	Wm. Taylor	Alcoholic.

CNEMIDOPHORUS GULARIS SEMIFASCIATUS Cope.

Cnemidophorus gularis semifasciatus COPE, Trans. Amer. Phil. Soc., XVII, 1892, p. 49, pls. XI, fig. 12; XII, fig. L.

Muzzle compressed rather elongate, with frenoöcular plate longer than high. Large scales of the collar confined to the middle portion, smaller scales appearing on each side, and granules on the edge of the

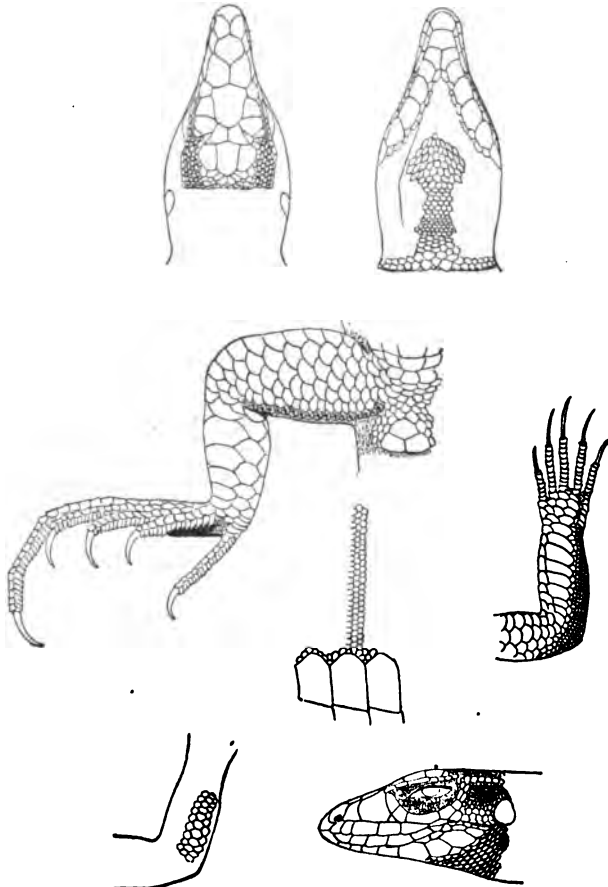


Fig. 121.

CNEMIDOPHORUS GULARIS SEMIFASCIATUS COPE.

= 1.

Coahuila, Mexico.

Cat. No. 9248, U.S.N.M.

collar laterally. Posterior supraorbital small and divided on both sides, perhaps abnormally. Interparietals as wide as parietals, and extending farther posteriorly. Large scales behind parietals few in number. Brachial scales in six; femorals in six rows. Postantibrachials in three or four rows. Femoral pores 20. Dorsal scales minute. Anal plates,

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three large ones with eight to ten smaller ones on the sides and in front. The hind leg a little short, the longest toe when extended not reaching the meatus auditorius by the diameter of the latter.

Measurements.—Total length, 300 mm.; length to angle of mandible, 25 mm.; length to collar, 32 mm.; length to axilla, 42 mm.; length to vent, 100 mm.; length of fore limb, 30 mm.; length of fore foot, 13 mm.; length of hind leg, 64 mm.; of hind foot, 35 mm.

The color is uniform olivaceous above and below, with the following black marks: There are three rows of black spots on each side of the middle line above; the superior small, subquadrate, the second larger and transverse, the inferior forming short crossbars. The superior row extends from the interscapular region to the middle of the length of the back; the second row extends further, and the inferior row extends nearly to the groin. Limbs, head, belly, and tail unspotted.

But two specimens are known to me. In Cat. No. 3033 the black spots are smaller and are restricted to the anterior fourth of the length of the body, being most distinct in front of the scapular region. Here traces of the original six stripes are visible between the spots.

This form has various peculiarities which entitle it to be regarded as a subspecies, and possibly as a species.

It is possible that it may be demonstrated that *C. sericeus* is established on a female of this species with abnormally reduced frontoparietal plates. The coloration is much like that of specimen Cat. No. 3033.

Cnemidophorus gularis semifasciatus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
9248	1	Coahuila, Mexico	Lieutenant Couch	Alcoholic.
3033	1	Patos, Coahuila	do	do.

CNEMIDOPHORUS LABIALIS Stejneger.

Cnemidophorus labialis STEJNEGER, Proc. U. S. Nat. Mus., XII, 1889, p. 643.

The following description is copied from Stejneger:

Nasal in contact with second supralabial; postnasal and first supralabial not in contact; two large preanals, the largest behind; dorsal scales equal; nostril anterior to nasal suture; eight longitudinal rows of ventral plates; femoral pores twelve to thirteen; fronto-parietals distinct; supraoculars four; caudal scales slightly oblique.

Nostril anterior to nasal suture; three parietals; four supraoculars; seven supraciliaries; a freno-orbital; two fronto-parietals; scales on middle of eyelid slightly enlarged, hexagonal; nasal in contact with second upper labial, postnasal and second upper labial being separated; posterior gular scales small, abruptly separated from the anterior, the line of demarkation between them being emphasized by the two rows nearest the latter being markedly smaller than the rest of the posterior ones; plates of the collar rather large, in several rows, the marginal largest; dorsal granules smooth, rather large; ventral plates in eight longitudinal and thirty-one transverse rows. Two large preanals, wider than high, the posterior plate being widest. Three rows of brachials of nearly the same size; antibrachials

continuous with brachials, in two rows, the outer one hardly larger; granules along posterior edge of under side of forearm but slightly enlarged. Five rows of femorals, outer largest; tibials in three rows, outer largest. Upper and lateral caudal scales slightly oblique, rather strongly keeled, and pointed posteriorly. Color above dark brown, with six longitudinal light lines and a median clay-colored band of the same shade as the top of the head; two light longitudinal lines on fore limbs and three on hind limbs; under side whitish, more or less suffused with bluish, especially on the flanks.

For dimensions, see table below.

In addition to the type, there are four other specimens which agree with it in all essential points; two of them have thirteen femoral pores, while two have only twelve; two have thirty-three rows of ventrals, one has thirty-one, and one thirty; three have three antibrachial rows, and in these the outer is by far the largest; two have only four femoral rows. In other respects the specimens are nearly identical.

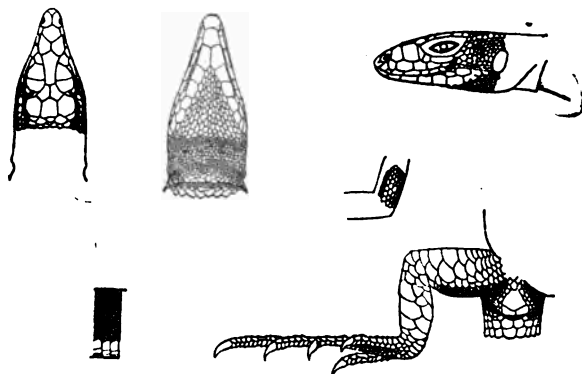


Fig. 122.

CNEMIDOPHORUS LABIALIS STEJNEGER.

= 1.

Lower California.

Cat. No. 15600, U.S.N.M.

List of specimens examined.

U. S. N. M. No.	Collec- tor.	Locality.	Femoral pores.	Transverse rows of ventrals.	Femoral rows.	Total length.	Snout to collar.	Width of head.	Snout to interparietal.	Width at post. corner of supraocular. reg.	Snout to fore limb.	Collar to vent.	Fore limb.	Hind limb.	Vent to end of tail.	Remarks.
15596	Belding	Cerro Is- land, Lower California.	13	31	5	187	mm. 18	mm. 8	mm. 10	mm. 5.3	mm. 19.5	mm. 37	mm. 18	mm. 40	mm. 132	Type.
15597	do	do	13	33	5	173	17	8	9.5	5.3	18	33	18	37	123	
15598	do	do	12	33	5	.....	17	8	10.3	5.3	20	37	18	38	.....	
15599	do	do	12	31	4	.....	17	7.5	9.5	5.5	18	34	18	36	.....	
15600	do	do	13	30	4	.....	18	8	9	.....	19	35	19	39	.....	

He also adds the following remarks:

Of all our North American *Cnemidophori* this seems to be the most distinct species, *Cnemidophorus* (*Verticaria*) *hyperythrus* not even excepted. As will be seen from an enumeration of the characters by which it differs from them all, viz: The peculiar relations of the nasals and anterior labials, the arrangement of the preanals, the low number of femoral pores, twelve to thirteen, brachials in three subequal rows, femorals in only four to five rows. Of these the first-mentioned character seems even to be unique in the genus, as I have seen no mention of it in the descriptions of extralimital species, and after a careful examination of about three hundred specimens of the various North American forms, I can find no approach to the condition which is so characteristic of the present species, in all five specimens of which it is equally well pronounced. The low number of femoral pores is also well worth noting, inasmuch as it entirely destroys the usefulness of one of the sections of Boulenger's key to the species (*Cat. Liz. Brit. Mus.*, II, pp. 360 and 361), relied upon to separate the South American species, *C. ocellifer* and *multilineatus*, from the other species with eight longitudinal rows of ventral plates and the nostrils opening in the nasal. The fusion of the two posterior preanals into one wide transversal plate seems to be another good character. It is true that this state of affairs is occasionally seen in specimens of *C. sexlineatus* or its numerous subspecies, but the occurrence is rare, hardly reaching 2 per cent in the enormous series examined by me, while in the Cerros Island species it is normal, since found equally well represented in all five specimens.

LACERTIDÆ.

Lacertiens CUVIER, part, Règne Anim., II, 1817, p. 22.

Lacertinidæ GRAY, Ann. Phil. (2), X, 1825, p. 200; Phil. Mag. (2), II, 1827, p. 55.

Trachydromioidea, *Lacertoidea* FITZINGER, part, Neue Classif. Rept., 1826, pp. 18, 22.

Autarchoglossæ pleurodontes WAGLER, part, Syst. Amph., 1830, p. 154.

Lacertæ WIEGMANN, part, Herpt. Mex., 1834, p. 9.

Lacertiens calodontes DUMÉRIL and BIBRON, Exp. Gén., V, 1839, pp. 16, 153.

Lacertinidæ, *Zonuridæ* GRAY, part, Cat. Liz., 1845, pp. 26, 45.

Holaspidæ GRAY, Proc. Zool. Soc., 1863, p. 152.

Lacertidæ COPE, part, Proc. Acad. Nat. Sci. Phila., 1864, p. 237.

Lacertidæ BOULENGER, Ann. and Mag. Nat. Hist. (5), XIV, 1884, p. 120.

Tongue flat, elongate, bifid in front and behind, covered with rhomboidal scale-like papillæ or overlapping plicæ, converging forward. Dentition strictly pleurodont, the teeth hollow at the base; lateral teeth bicuspid or tricuspid; pterygoids frequently toothed. Premaxillary bone single; nasal and frontal double; parietal single; postorbital and postfrontotemporal arches complete; interorbital septum and columella crânii well developed; palatines and pterygoids separated on the median line. Skull with bony dermal plates, roofing over the supratemporal fossæ. Limbs well developed, pentadactyle. Clavicle dilated and perforated proximally; interclavicle cruciform. Tail long, fragile. Pupil round; eyelids well developed. Ear opening distinct; femoral pores usually present.

Head with symmetrical shields; those on the upper surface are (normally) a frontonasal, a pair of prefrontals, a frontal, two to four supraoculars, a pair of frontoparietals, a pair of parietals, and interparietal, and an occipital. The latter shield is absent in many species, and so are the frontoparietals in the genus *Holaspis*. Dorsal scales

juxtaposed or imbricate, usually smaller than the ventrals, which form longitudinal and transverse series. (Boulenger.)

I have only had opportunity to examine the visceral anatomy of the genera *Tachydromus*, *Lacerta*, and *Eremias*. These possess a urinary bladder and a corpus adiposum, which projects freely into the abdominal cavity. The alimentary canal displays no colon. The liver is not elongate, and exhibits a small middle (third) lobe of the posterior border. Its right lobe exhibits a recurved lobe from its extremity, which points posteriorly next the body wall. The mesenteries are of the usual or normal type of the order.

They inhabit Europe, Asia, and Africa; are absent from Madagascar, and most abundantly represented in Africa, with but few in the East Indies.

I have examined the hemipenis in the genera *Lacerta*, *Acanthodactylus*, and *Latastia*. They are bifurcate or bilobate. In each division and proximal to it is an oval area with transverse laminae and surrounded by a welt. In *Acanthodactylus* one of the areas is marked by longitudinal folds.

SYNOPSIS OF THE GENERA.

I. Frontal plate separated from the interparietal by a pair of frontoparietals; tail not much depressed.

A. Nostril above the first labial, from which it is separated, if at all, by a narrow rim; transparent palpebral disk, if present, considerably smaller than the eye.

1. Inguinal but no femoral pores..... *Tachydromus* Daudin.

2. Femoral pores.

a. Ventral plates keeled *Poromera* Boulenger.

b. Ventrals smooth.

Collar well marked; dorsal scales much smaller than caudals; digits not fringed laterally, not keeled inferiorly *Lacerta* Linnaeus.

Collar well marked; dorsal scales nearly as large as caudals, strongly imbricate; digits not fringed laterally, not keeled inferiorly.

Algiroides Bibron.

Collar very indistinct or absent; digits not fringed laterally.

Psammodromus Fitzinger.

Collar well marked; digits not fringed laterally; keeled inferiorly.

Latastia Bedriaga.

Collar more or less distinct; digits fringed laterally and keeled.

Acanthodactylus Wiegmann.

AA. Nostril well separated from the labials.

1. Lower eyelid scaly or with a small transparent disk.

a. Digits smooth or indistinctly keeled inferiorly, not fringed laterally.

Collar well marked; ventral plates keeled..... *Gastropholis* Fischer.

Collar absent; dorsal scales large, imbricate, strongly keeled.

Tropidosaura Fitzinger.

Collar well marked; dorsal scales small; ventral plates smooth.

Nucras Gray.

b. Digits distinctly keeled inferiorly, not fringed laterally.

Collar absent; dorsal scales large, imbricate, strongly keeled.

Ichnotropis Peters.

Collar more or less distinct; dorsal scales small... *Eremias* Wiegmann.

- c. Digits fringed laterally.
 Femoral pores *Scapteira* Wiegmann.
 No femoral pores *Aporosaura* Boulenger.
2. Lower eyelid with a very large transparent disk covering nearly entirely the eye; digits strongly keeled inferiorly.
 Lower eyelid movable *Cabrita* Gray.
 Lower eyelid united with the upper *Ophiops* Ménétriés.
- II. No frontoparietals; tail much depressed denticulated laterally... *Holaspis* Gray.

GERRHOSAURIDÆ.

- Scincidæ*, *Anguidæ* GRAY, part, Am. Phil. (2), X, 1825, p. 201.
Ophisauroidæ FITZINGER, part, Neue Classif. Rept. 1826, p. 20.
Autarchoglossæ WAGLER, part, Syst. Amph., 1830, p. 196.
Ptychopleuri WIEGMANN, part, Herpt. Mex., 1834, p. 11.
Chalcidiens ptychopleures DUMÉRIL and BIBRON, part, Exp. Gén., V, 1839, p. 336.
Zonuridæ GRAY, part, Cat. Liz. Brit. Mus., 1845, pp. 5, 45.
Zonuridæ COPE, part, Proc. Amer. Assoc. Adv. Sci., XIX, 1871, p. 237.
Gerrhosauridæ BOULENGER, Ann. and Mag. Nat. Hist. (5), XIV, 1884, p. 120; Cat. Liz. Brit. Mus., III, 1887, p. 119.

Boulenger describes this family as follows:

Tongue moderately elongate, bifid posteriorly, free and very feebly nicked anteriorly, covered with intricate scales like papillæ or oblique plicæ converging anteriorly towards the median line. Dentition pleurodont; teeth closely set, with long cylindrical shafts, hollow at the base, with conical or bicuspid crowns. Pterygoid teeth often present. Skull in every respect similar to that of the *Lacertidæ*, with dermal ossification roofing over the supratemporal fossæ. Limbs well developed or rudimentary. Clavicle dilated and loof-shaped proximally; interclavicle cruciform. Tail long and fragile. Head with symmetrical shields. Body with squarish or rhomboidal imbricate scales, which often form regular longitudinal and transverse series; it is besides protected by osteodermal plates, underlying the scales, which show a system of longitudinal tubules intersecting a transverse one, as in the *Scincidæ*; this structure usually more distinct on the ventral plates than on the thicker and rougher dorsal ones. A lateral fold with granular scales, similar to that of *Gerrhonotus*, is present in all genera except *Tracheloptychus*, which in its scaling more resembles the *Scincs*.

Femoral pores constantly present. Eyelids well developed. Tympanum distinct.

In the hemipenis in *Gerrhosaurus nigrolineatus*, there are on the distal third, three welts opposite the sulcus, the median larger, all finely cross folded. Between one of these and the sulcus is a tract of coarse papillæ; between the other and the sulcus the surface is smooth.

This family is exactly intermediate between the *Lacertidæ* (single premaxillary, femoral pores) and the *Scincidæ* (presence and structure of the dermal bony plates). It is strictly African, its headquarters being South Africa and Madagascar, and extending northward to the southern limit of Sahara.

SYNOPSIS OF THE GENERA.

- I. Nostril pierced between two nasals and the first labial; ventral plates forming straight transverse series.
 Tongue nearly entirely covered with intricate scale-like papillæ; prefrontals and frontoparietals present; lower eyelid scaly..... *Gerrhosaurus* Wiegmann.

- Tongue nearly entirely covered with oblique plicæ; no prefrontals; frontoparietals present; lower eyelid scaly; limbs short; toes 5-5..... *Cicigna* Gray.
 Like *Cicigna*; digits 4-4..... *Sauropsis* Fitzinger.
 Like *Cicigna*; limbs minute, undivided..... *Cælia* Gray.
 Tongue nearly entirely covered with imbricate scale-like papillæ; no prefrontals; frontoparietals present or absent; lower eyelid with a large, transparent disk..... *Cordylus* Gray.
- II. Nostril pierced between two nasals, the rostral, and the first labial; ventrals not forming straight transverse series.
 A lateral fold along the body; no frontoparietals..... *Zonosaurus* Boulenger.
 No lateral fold on the body; frontoparietals present..... *Tracheloptychus* Peters.

SCINCIDÆ.

Scincoidiens CUVIER, part, Règne Anim., II, 1817, p. 52.

Scincida, *Anguida*, GRAY, part, Ann. Phil. (2), X, 1825, p. 201.

Cordyloidea, *Scincoidea*, *Gymnophthalmoidea* FITZINGER, part, Neue Classif. Rept., 1826, pp. 18, 23, 26.

Laerta antarchoglossæ WAGLER, part, Syst. Amph., 1830, p. 144.

Scinci, *Gymnophthalmi* WIEGMANN, part, Herp. Mex., 1831, p. 11.

Scincida, *Gymnophthalmida*, *Rhodonida* GRAY, part, Ann. Nat. Hist., II, 1838, p. 287.

Chalcidiens, *Scincoidiens saurophthalmes* and *ophiophthalmes*, DUMÉRIE and BIBRON, part, Exp. Cén., V, 1839, pp. 318, 553, 805.

Gymnophthalmida, *Scincida*, *Ophiomorida*, *Sepsida* GRAY, part, Cat. Liz. Brit. Mus., 1845, pp. 62, 70, 120, 121.

Scincida, *Sepsida* COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 229.

Scincida BOULENGER, Ann. and Mag. Nat. Hist. (5), XIV, 1884, p. 120; Cat. Liz. Brit. Mus., 2d ed., III, 1885, p. 130.

Boulenger's description is as follows:

Tongue moderately long, free and feebly nicked in front, covered with imbricate scale-like papillæ. Dentition pleurodont, teeth conical, bicuspid, or with spheroidal or compressed crowns; the new teeth hollow out the base of the old ones. Pterygoid teeth may be present.

Præmaxillary bones two, sometimes incompletely separated; nasal double; frontal single or double; parietal single; postorbital and postfrontotemporal arches complete, osseous; interorbital septum and columella cranii well developed; infra-orbital fossa present, bounded by the maxillary, the transverse bone, the palatine, and often also by the pterygoid. Skull with bony dermal plates overroofing the supratemporal fossa.

Limbs present or absent; pectoral and pelvic arches constantly present. Clavicle dilated and usually perforated proximally, interclavicle cruciform. Ossified abdominal ribs are absent.

Body protected by bony plates underlying the scales, which are cycloid-hexagonal, rarely rhomboidal, imbricate, arranged quincuncially. These plates provided with symmetrical tubules, which usually consist of a transverse one anastomosing with several longitudinal ones. Head covered with symmetrical shields; an azygos occipital is rarely present. Pupil round. Eyelids well developed. No femoral pores.

Scincoids are cosmopolitan, the bulk occurring in Australia, the islands of the Pacific, the East Indies, and Africa; they are comparatively very poorly represented in South America. As far as we know at present, all species are ovoviviparous. Adaptations to every mode of life, save aquatic and aerial occur.

This family presents considerable variety in the details of the structure of the viscera. In such genera without internasal plates as I have

had opportunity to dissect, I have found no corpus adiposum, while this structure is well developed on the forms with supranasal plates. In serpentiform types, here as in the Anguidæ, the liver is situated more posterior to the heart, being separated from it by an interspace, which is not present in the strictly lacertiform types. I have only found a colon in three types, the Australian *Egernia major*, a pea green *Liolepisma* from some part of the Australian realm, and a *Chalcides lineatus* from Morocco. The *Trachysaurus rugosus* of Australia is remarkable for the shortness and large diameter of its alimentary canal, the diameter being similar all the way through, and the course being a simple sigmoid. In all other genera there is a small intestine distinct from the stomach and rectum, which is more or less plicated in its course.

The characteristics which I have observed may be tabulated as follows:

I. No corpus adiposum.

A. No small intestine; liver three-lobed.

Middle lobe of liver superior to the others and produced into a long strip.

Trachysaurus.

AA. A plicate small intestine.

α. No colon.

Liver adjacent to heart, two-lobed, right lobe little produced.

Mocoo,¹ *Tiliqua*,² *Hinulia*.³

Liver moderately posterior to heart; three-lobed, the right lobe produced..... *Liolepisma (laterale)*.

Liver well posterior to heart; liver two-lobed; right lobe produced; small intestine short, with only one fold of sigmoid..... *Siaphos*.⁴

αα. A colon (short and wide).

Liver adjacent to heart, two-lobed posteriorly, right much prolonged.

Liolepisma (green sp.), *Egernia*.⁵

II. Corpus adiposum present, adherent to body wall.

A. A plicated small intestine.

α. A colon.

A short cæcum; liver well posterior to heart, the right lobe much larger than the left; right lung longer than left..... *Chalcides*.⁶

III. Corpus adiposum free from the body wall.

A. A plicated small intestine; no colon; liver two-lobed posteriorly.

Lungs equal; right lobe of liver moderate; small intestine sinuous... *Eumeces*.⁷

Lungs equal; small intestine large and little sinuous..... *Euprepes*.⁸

Left lung or both lungs short; small intestine contracted and short... *Mabuia*.⁹

The genera without corpus adiposum are inhabitants of the Australian zoological realm, excepting the Central American *Mocoo assata*, and the North and Central American *Liolepisma laterale*.

¹ *M. assata* Cope.

² *T. scincoides* White.

³ *H. taniolata* White, and a second species.

⁴ *S. æqualis* Gray.

⁵ *E. major* Gray.

⁶ *C. lineatus* Leuckart.

⁷ *E. quinquelineatus* Linnaeus and *E. obsoletus* Baird and Girard.

⁸ *E. multifasciatus* Kuhl.

⁹ *M. agilis* Raddi; left lung shorter than right; *M. aurata*, both lungs short.

I have examined the hemipenis in *Trachysaurus*, *Lepidothyris* (*fernandi*), *Euprepes* (*carinatus*), *Eumeces* and *Mabuia*. They are smooth and with more or less numerous longitudinal folds, excepting in *Trachysaurus*. Here the laminae diverge from the sulcus proximad and turn to a horizontal direction, meeting opposite the sulcus in a chevron directed distad. In *Euprepis carinatus* and *Eumeces obsoletus* some of the plicæ are cross ribbed. In *Lepidothyris fernandi* the organ is shortly bifurcate, and each division has a membranous welt next the adjacent division.

I have examined the arches and limbs of the *Chalcides lineatus* with the following results:¹

Scapular and pelvic arches present. Limbs of both pairs present, very short, with digits 3-3.

Scapular arch.—All the elements present, and presenting the true characters of the Leptoglossa, namely, clavicles distally dilated and perforate, and interclavicle cruciform. The scapula and coracoid are fused and osseous. The coracoid cartilage incloses a coracoid foramen, and coraco-precoracoid foramen with the cartilaginous precoracoid. Suprascapula large, cartilaginous. Sternum well developed, with cartilaginous borders, no foramen, and four costal articulations.

Pelvic arch.—All the elements present, but slender; the inferior arches directed anteriorly; the pubes in contact distally. The ischia are separated by a narrow membrane, which extends forward to the pubic symphysis. The ilium stands nearly vertical, its inferior portion articulating with the distally fused extremities of the diapophyses of two vertebræ. Except in the slenderness of its parts, the pelvis is like that of Scincidæ with well developed limbs.

Fürbringer represents only three sterno-costal articulations in the *C. tridactylus*.

The food of the species of Scincidæ is principally insects. One exception to this is a pea-green species of *Lirolepis* from Australasia from whose alimentary canal I took some seeds resembling cherry stones.

The *Evesia monodactyla* Gray, from Ceylon, which is allied to *Acontias*, I found to present the following characters of the arches and limbs:

Scapular and pelvic arches present. Anterior and posterior limbs present, external, very rudimental, and undivided.

Scapular arch.—All the elements present. Sternum cartilaginous, with two costals; clavicles osseous, proximally simple. Interclavicle a simple, longitudinal, bony splint. Scapula and coracoid distinct; only ossified on their posterior borders. Coracoid and precoracoid cartilages not distinct, nor inclosing any fontanelles. Anterior limb consisting of a humerus with a minute cubital segment.

Pelvic arch.—Elements present subequal; the inferior directed forward, meeting on the middle line, without longitudinal connection.

¹ Journal of Morphology, 1892, p. 236.

Ilium directed slightly forward and upward, and articulating by its proximal extremity with the fused distal extremities of the diaphyses of two vertebræ. Posterior limb exactly like the anterior, that is, consisting of a proximal element (femur) and a distal rudimental segment.

Fürbringer¹ describes and figures the shoulder and pelvic girdles of *Acontias meleagris* and *A. plumbeus*. The shoulder girdles consist of simple elements supposed to represent scapulæ, fused or not on the middle line, the median portion of which, in the *A. plumbeus*, it is suggested, may be clavicles. The pelvic girdles consist, in both species, of a simple element on each side, consisting of ilium (joined to vertebræ) and supposed pubis. My examination of *Evesia* shows the impropriety of combining that genus with *Acontias*, as has been done by Boulenger.

As in other families, in the serpentiform types the liver and stomach occupy a position caudad to the lungs, and so the latter do not appear in the mesenteric connections of the former; as, for instance, *Siaphos*. The mesenteries are the usual ones, but one peculiarity is very frequent, though not universal in the family. The hepatovenral sheet is generally divided into two, a right and a left sheet, next the liver, forming a pocket, which opens caudad. In the *Tiliqua scincoides* the two sheets only unite at the cephalic end of the liver, remaining separate throughout.

Dr. Boulenger remarks as to this family:

I have met with great difficulty in arranging the genera of this family. The majority of the characters hitherto employed for the distinction of genera, such as the degree of development of the limbs, the presence or absence of a transparent disc in the lower eyelid, the presence or absence of keels on scales, etc., are in many cases not even of specific value. I have therefore used certain characters which hitherto have been neglected, but which, I am convinced, afford a firmer basis for a natural arrangement. The artificial nature of an arrangement based on the degree of the development of the limbs has been pointed out by others. In a family like the Scincoids, in which the limbs are undergoing a process of abortion, this character must be abandoned as one expressing relationship by itself. And I trust that the arrangement of the species in one or more series within a genus, passing from forms with well developed pentadactyle limbs and lacertiform physiognomy to such as have rudimentary limbs, or even none at all, marks a great improvement upon the artificial classifications in use down to the present day.

I am not prepared to admit that the above remarks of Dr. Boulenger have more than an application to the cases where the development of the limbs and digits is irregular in the same species. This has not been shown to be the case more frequently than we expected to find in all other zoological characters, and particularly those which we call generic. It is indeed precisely the grades of characters expressed by the last structural modification of parts that the generic nomenclature is created to record. So long as the characters are constant then it is necessary to designate them by generic terms, and I have therefore

¹ Knochen und Muskeln Schlangenähnlicher Saurier, Leipsic, 1880.

adopted in the following synopsis of genera those which have been proposed by my predecessors for the various degrees of development of the limbs and toes.

SYNOPSIS OF THE GENERA.

I. Nostril pierced in the nasal, or between nasal and supranasal or postnasal or first upper labial, not touching the rostral.

A. Palatine bones separated on the median line of the palate; no supranasal shields.

No azygous occipital shield..... *Egernia* Gray.

An azygous occipital shield, in contact with the interparietal; tail prehensile.
Corucia Gray.

AA. Palatine bones in contact on the median line of the palate.

1. Tympanum, if distinct, more or less deeply sunk.

a. Pterygoid bones separated on the median line of the palate, the palatal notch extending anteriorly to an imaginary line connecting the center of the eyes.

α. No supranasals.

Lateral teeth with obtuse or spheroidal crowns; an azygous occipital in contact with the interparietal; subdigital lamellæ divided.

Trachysaurus Gray.

Lateral teeth with obtuse or spheroidal crowns; subdigital lamellæ undivided..... *Tiliqua* Gray.

An enormous crushing tooth on each side of each jaw.

Hemisphaeriodon Peters.

β. Supranasals present.

Lateral teeth with compressed denticulated crowns; a series of suborbital shields..... *Macrosclincus* Bocage.

Lateral teeth conical; two frontoparietals..... *Mabuya* Fitzinger.

Lateral teeth conical; one frontoparietal..... *Monophyasps* Cope.

b. Pterygoids in contact (at least quite anteriorly) mesially, the palatal notch not extending anteriorly to between the center of the eyes.

* Eyelids movable; digits with nonretractile claws.

† Supranasal plates present (tympanum not concealed).

‡ Lower eyelid with a transparent disc.

§ Frontoparietal single.

Digits, 5-5..... *Emoa* Gray.

Digits, 5-4..... *Hagria* Gray.

Digits, 4-4..... *Chiamela* Gray.

§§ Two frontoparietals.

Digits, 5-5..... *Riopa* Gray.

Digits, 2-3..... *Eumecia* Bocage.

‡‡ Lower eyelid scaly.

§ Frontoparietal single.

Digits, 5-5..... *Monophorus* Cope.

§§ Two frontoparietals.

Digits, 5-5..... *Lepidothyris* Cope.

‡‡ Supranasal plates wanting.

‡ Lower eyelid with a transparent disc.

|| Tympanum not concealed.

§ Frontoparietal plate single.

Digits, 5-5..... *Mocoa* Gray.

Digits, 4-5..... *Heteropus* Duméril and Bibron.

Digits, 1-2..... *Brachystopus* Duméril and Bibron.

Digits, 1-1..... *Oncopus* Cope.

Digits, 0-2..... *Oloochirus* Cope.

Digits, 0-1..... *Soridia* Gray.

- § Frontoparietal plate double.
 - Digits, 5-5..... *Lirolepisma* Duméril and Bibron.
 - Digits, 3-3..... *Tridentulus* Cope.
 - Digits, 1-2..... *Furcillus* Cope.
- || Tympanic meatus closed.
 - § Frontoparietal single.
 - Digits, 5-5..... *Haploscincus* Cope.
 - §§ Frontoparietals distinct.
 - Digits, 4-4..... *Tetradactylus* Cuvier.
 - Digits, 3-3..... *Hemiergis* Wagler.
 - Digits, 2-2..... *Chelomeles* Duméril and Bibron.
- †† Lower eyelid scaly.
 - || Tympanic meatus not closed.
 - § Frontoparietal single.
 - Digits, 5-5..... *Lygosoma* Gray.
 - § Frontoparietals two.
 - Digits, 5-5..... *Homolepida* Gray.
 - || Tympanic meatus closed.
 - § Frontoparietal single.
 - Digits, 5-5..... *Cophoscincus* Peters.
 - Digits, 3-1..... *Anomalopus* Duméril and Bibron.
 - §§ Frontoparietals distinct.
 - Digits, 5-5..... *Nannoscincus* Günther.
 - Digits, 3-3..... *Siaphos* Gray.
 - Digits, 2-2..... *Dimeropus* Cope.
 - Digits, 1-1..... *Coloscincus* Peters.
 - Limbs wanting..... *Ophioscincus* Peters.
- ** Eyelids immovable, transparent; covering the eye.
 - † Supranasals present.
 - Two frontoparietals; ear exposed; digits 5-5..... *Panaspis* Cope.
 - †† No supranasals.
 - || Two frontoparietals (ear not closed).
 - Digits 5-5..... *Ablepharus* Fitzinger.
 - Digits 4-4..... *Miculia* Gray.
 - Digits 3-3..... *Phaneropsis* Fischer.
 - Digits 2-3..... *Lerista* Gray.
 - || One frontoparietal.
 - § Ear exposed.
 - Digits 5-5..... *Cryptoblepharus* Wiegmann.
 - Digits 4-4..... *Menetia* Gray.
 - Digits 4-4..... *Blepharactis* Hallowell.
 - §§ Ear concealed.
 - Digits 5-5..... *Blepharosteres* Stoliczka.
- *** Eyelids movable; claws retractile into a sheath.
 - Digits 4-5..... *Ristella* Gray.
- 2. Tympanum exposed and superficial.
 - Head normal..... *Tropidophorus* Duméril and Bibron.
 - Head a bony casque, well separated from the neck.
 - Tribolonotus* Duméril and Bibron.
- AAA. Palatine bones separated on the median line; supranasal shields present.
 - Nostril pierced in the nasal; pterygoid bones toothed; limbs pentadactyle; the digits not denticulated laterally..... *Eumeces* Wiegmann.
 - Nostril pierced in a very small nasal, between the rostral, the first labial, the supranasal and sometimes a postnasal; palate toothless; digits 5-5; limbs short..... *Senria* Gray.

- Like *Senira*, but limbs rudimental, undivided.. *Brachymeles* Duméril and Bibron.
 Nostril pierced between an upper and a lower nasal; limbs pentadactyle, the digits denticulated laterally..... *Scincus* Laurenti.
 Nostril pierced between the nasal and supranasal; digits 4-3.. *Zygnopsis* Blanford.
 Like *Zygnopsis*, but digits 3-3..... *Sphenoscincus* Peters.
 Like *Zygnopsis*, but digits 3-2..... *Hemipodium* Steindachner.
 Like *Zygnopsis*, but limbs absent..... *Ophœomorus* Duméril and Bibron.

II. Nostril pierced in the posterior border of the rostral, or between a nasal or a labial and the rostral.

A. Palatine bones in contact on the median line.

Nostril pierced between the rostral and a very small nasal, which may be reduced to a narrow ring.

- Digits 5-5; frontoparietals distinct..... *Thyrus* Gray.
 Digits 5-5; no frontoparietals or prefrontals.. *Amphiglossus* Duméril and Bibron.
 Digits 3-3..... *Sepomorphus* Peters.
 No fore limbs; hind limbs didactyle..... *Scelotes* Fitzinger.
 No fore limbs; hind limbs undivided..... *Podoclonium* Cope.
 No limbs externally..... *Herpetosaura* Peters.

AA. Palatine bones separated on the median line.

1. Supranasals present; first upper labial not touching the nostril.

* Nostril pierced between the rostral and a very small nasal in an emargination of the former shield.

a. Labial border rounded.

- Digits 5-5..... *Gongylus* Wagler.
 Digits 4-4..... *Gongyloseps* Boettger.
 Digits 3-4..... *Allocladotylus* Lataste.
 Digits 2-4..... *Anisoterma* Duméril.
 Digits 3-3..... *Chalcides* Laurenti.
 Digits 2-3..... *Heteromeles* Duméril and Bibron.
 Digits 1-1 (limbs undivided)..... *Diadonotus* Cope.

aa. Labial border projecting, acute.

- Digits 4-5-4-5..... *Sphærops* Wagler.

** Nostril pierced between the rostral and a very small nasal, which is situated between the former shield and the first labial.

Herpetoseps Boulenger.

2. Supranasals present; first upper labial entering the nostril.

* Nostril pierced between the rostral, the supranasal, the postnasal, and the first labial; no frontoparietals.

- Digits 5-5..... *Mesomycetus* Cope.
 Digits 4-4..... *Rhinoscincus* Peters.
 Digits 3-3..... *Sepsina* Bocage.
 No forelimbs; hind limbs undivided..... *Dumerilia* Bocage.

** Nostril pierced between the rostral and the first labial.

Limbs absent..... *Melanoseps* Boulenger.

*** Nostril pierced between the rostral, the supranasal, and the first labial; frontoparietals present.

Limbs absent..... *Lepophis* Beddart.

3. No supranasals; nostril entirely in the rostral.

Limbs short; digits 4-4..... *Chalcidoseps* Boulenger.

LIOLEPISMA Duméril and Bibron.

Liolepisma DUMÉRIL and BIBRON, *Exp. Gén.*, V, 1839, p. 742.—GRAY, *Cat. Liz. Brit. Mus.*, 1845, p. 84.

Oligosoma GIRARD, *Proc. Acad. Nat. Sci. Phila.*, 1857, pp. 196-245; U. S. *Expl. Exp.*, *Herp.*, p. 235.

Nostril pierced in the nasal plate. Palatine bones in contact on the median line of the palate. Tympanum not covered with integument. Pterygoid bones in contact on the middle line. Eyelids movable; digits with nonretractile claws. Supranasal plates wanting. Lower eyelid with a transparent disk; two frontoparietal plates; digits 5-5.

This genus embraces twenty-eight species, all of which are referred to *Lygosoma*, Section IV, in Boulenger's Catalogue of the Lizards in the British Museum. Of these, five are from New Zealand; five are from Australia and adjacent islands; four are from the Pacific islands and New Guinea; three are from the Philippines; six are from India; one from the Mauritius; two from West Africa; and one, the species described below, is from North America, and, according to Boulenger, from China. South America and (excepting China) the temperate parts of Asia and Europe are not possessed of any species of *Liolepisma*.

The genus is markedly different from *Eumeces* in the absence of internasals, the frontal coming broadly in contact with the rostral as well as the nasals. The palate has a triangular notch running to a point instead of being more linear and hollowed anteriorly. There are no pterygoid teeth as in *Eumeces*. The tongue appears flatter and more extensible at the tip.

LIOLEPISMA LATERALE Say.

Liolepisma laterale DUMÉRIL and BIBRON, *Exp. Gén.*, V, 1839, p. 719.—HOLBROOK, *N. Amer. Herp.*, 2d ed., II, 1842, p. 133, pl. xix.—BOULENGER, *Cat. Liz. Brit. Mus.*, 1885, III, p. 263.

Scincus lateralis SAY, Long's *Expd. Rocky Mts.*, II, 1823, p. 324.—HARLAN, *Journ. Acad. Nat. Sci. Phila.*, V, 1825, p. 221; VI, 1828, p. 12.—HOLBROOK, *N. Amer. Herp.*, 1836, I, p. 71, pl. viii.

Scincus unicolor HARLAN, *Journ. Acad. Nat. Sci. Phila.*, V, 1825, pp. 156, 221.

Oligosoma gemmingerii COPE, *Proc. Acad. Nat. Sci. Phila.*, 1864, p. 180.

Oligosoma laterale COPE, *Check-list N. Amer. Rept.*, p. 39.

Lygosoma (Mocoo) lateralis BOCOURT, *Miss. Sci. Mex.*, *Rept.*, 1881, p. 446, pl. xxii F, fig. 3.

Mocoo lateralis GRAY, *Cat. Rept. Brit. Mus.*, 1845, p. 83.—GÜNTHER, *Biol. Centr. Amer.*, *Rept.*, p. 31.

Lygosoma (Mocoo) gemmingerii BOCOURT, *Miss. Sci. Mex.*, *Rept.*, p. 449.

Body slender, quadrangular; vent rounded, attenuated one and one-half times the body; frontal in contact behind with the vertical, before with the rostral; the prefrontals small; lateral. Nasal above the first labial, in contact above with the internasal; the postnasal and one loreal in contact with the postfrontal. Seven upper labials. Ears large, vertical. Lower eyelid transparent in the center; without scales.

Scales very thin and membranous; generally 28 rows around the

body. The hind legs applied twice forward reach halfway between arm and ear; contained three times in head and body. Fifth hind toe shorter than second. Free portion of longest toe half the head.

Upper parts of head and body uniform reddish olive, sometimes bronzed or greenish for a width of about six rows of scales. This on the edges changes indistinctly to a light line, which appears to be on the adjacent edges of two rows of scales. Immediately below this is a blackish lateral stripe from the nose and through the eye about $1\frac{1}{2}$ scales wide, with or without a white line below it, and below the sides are striped alternately with dusky and lighter. Under parts yellowish white with faint lines along the adjacent edge of scales. Tail sometimes greenish or pale livid beneath.

The color varies above to a considerable extent, and sometimes (including the top of head) is irregularly spotted with blackish. The upper lateral dusky stripe is well defined above, sometimes very faint below. The alternating dark and light lines are sometimes quite uniform dusky or dusky, dotted with lighter by the breaking up of the light lines. The scales beneath have generally a bronzed or brassy reflection, and the lines along the junction of the rows of scales sometimes quite distinct. Sometimes there are faint traces of light lines along the centers of the dorsal rows of scales. There may generally be detected two light lines below the dark lateral band 1 to $1\frac{1}{2}$ scales apart, after which each row of scales is light along the center and finely mottled externally.

The lower edge of the larger lateral dusky stripe is frequently effaced. The dark spots on the dorsal surface sometimes exhibit a tendency to linear arrangement in two series.

I can not distinguish Texas specimens from more Eastern ones, though it is possible that, if the outlines of the scales and plates were more distinct, characteristic features might be found. The lateral black stripes are perhaps better defined and the arrangement of the dorsal dark specks into ten series more marked.

Cat. No. 3152, from Arkansas, collected by Dr. Woodhouse, differs in having the broad dorsal band divided into three, a central darker covering four rows of scales and two lateral lighter two-thirds as wide. The central stripe is darker externally and rather more so along the center, and may almost be considered as formed of lines, or three lines, the breaking of which may be considered as producing the dots found in some specimens, and as illustrating the primary pattern of coloration (two dark lines along the middle of the back, two rows of scales apart).

This species ranges over the Austroriparian region, extending into the Carolinian district of the Eastern as far as Burlington County, New

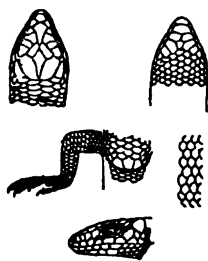


Fig. 123.

LIOLEPISMA LATERALE SAY.

× $\frac{1}{2}$.

North Carolina.

Cat. No. 4971, U.S.N.M.

Jersey, where it has been taken by Dr. J. Percy Moore. It extends up the Mississippi Valley into southern Illinois and Indiana, and is found everywhere in Texas as far southwest as the Nueces River. A large form inhabiting eastern Mexico I have called *L. gemingerii*. Boulenger does not regard it as distinct.

Liolopisma laterale Say.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4144	1	Brazos, Texas.		Shumard	
3173	1	Cache Creek, Texas.		Marcy	
3154	1	Rio Seco, Texas.	Apr. 7, 1855	Pope	
3174	2	New Braunfels, Texas			
3169	† 12	Indianola to Nueces		Pope	
3140	1	San Pedro		Graham	
3126	4	Indianola.		do	
3152	1	Arkansas River		Woodhouse	Type.
3175	10	Charleston, South Carolina			
4141	1	Indian Key, Florida		Wurde mann	
3132	2	Fort Inge, Texas		Whipple	
3135	2	Near San Antonio		do	
3111	2	Southern Illinois		R. Kennicott.	
3134	1	Fort McKavett, San Saba, Texas.		Dr. Anderson.	
4160	3	Pensacola, Florida		R. W. Jeffrey.	
4159	2	New Orleans to Galveston.		Dr. Anderson.	
4158	† 12	Mississippi near Natchez		B. L. C. Wailes	
4161	10	Prairie Mer Rouge, Louisiana.			
5080	1	Wheelock, Texas			Alcoholic.
4972	3	Anderson, South Carolina		Maj. M. E. Daniel	do.
5010	3	Calcasieu Pass, Louisiana.		G. Wurde mann.	do.
5053	3	Grand Coteau, Louisiana		St. Charles College	do.
8334	3	Kinston, North Carolina		J. W. Milner	do.
8805	7	Augusta, Georgia.		Wm. Phillips.	do.
6072	1	Fort Scott, Kansas		Lieut. Eustis, U. S. A.	do.
5009	1	Russellville, Kentucky			do.
9217	12				do.
9218	4				do.
5036	1	New Orleans, Louisiana		N. O. Academy	do.
9302	1	West Northfield, Illinois		R. Kennicott	do.
4971	1	Salem, North Carolina		J. T. Lineback	
10906	1	Wheatland, Indiana	Apr. —, 1881	Robert Ridgway	do.
11864	3	Clearwater, Florida	July 14, 1879	S. J. Walker	do.
12057	1	Mount Carmel, Illinois	— —, 1880	L. M. Turner	do.
22482	1	Marshall Hall, Maryland			do.
11919	2	Nashville, Georgia	Aug. 14, 1880	W. J. Taylor	do.
9218	2	(?)			do.
9282	2	(?)			do.
9213	3	(?)			do.
15381		New Orleans, Louisiana		Dr. R. W. Shufeldt	
15542		Cooke County, Texas		G. H. Ragdale	
17382		Mount Vernon, Virginia		C. W. Richmond	
18012		St. Louis, Missouri		Julius Hurter	
20492		Sycamore Creek, Texas		J. A. Potter	
22507		Chuluota, Florida		Robert A. Mills	

EUMECES Wiegmann.

Eumeces WIEGMANN (part), *Herp. Mex.*, 1834, p. 36; *Arch. f. Naturg.*, II, 1835, p. 288; *Arch. f. Naturg.*, 1837, I, p. 131.—PETERS, *Mon. Berl. Ac.*, 1864, p. 48.—STOLICZKA, *Journ. Asiat. Soc. Beng.*, XLI, 1872, p. 121.—BOCOURT, *Miss. Sci. Mex.*, Rept., 1879, p. 418.—BOULENGER, *Cat. Liz. Brit. Mus.*, III, 1887, p. 365. *Mabuya* FITZINGER, part, *N. Classif. Rept.*, 1826, p. 23. *Euprepis* WAGLER, part, *Syst. Amph.*, 1830, p. 161.—COCTEAU, *Tabl. Synop.*, 1857. *Plestiodon* DUMÉnil and BIBRON, *Erp. Gén.*, V, 1839, p. 697.—GRAY, *Cat. Liz.*, 1845, p. 90.—HALLOWELL, *Proc. Acad. Nat. Sci. Phila.*, 1857, p. 215.—BAIRD, *Proc. Acad. Nat. Sci. Phila.*, 1858, p. 206.—COPE, *Proc. Acad. Nat. Sci. Phila.*, 1861, p. 320.

Lamprosaurus HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1852, p. 206.

Eurylepis BLYTH, Journ. Asiat. Soc. Beng., XXIII, 1854, p. 739.

Mabonia GÜNTHER, Proc. Zool. Soc. Lond., 1860, p. 316; Rept. Brit. Ind., 1864, p. 82.

Nostril pierced in the nasal plate. Palatine and pterygoid bones separated on the median line of the palate, the latter with teeth. Supra-nasal plates present. Limbs pentadactyle, the digits not denticulated laterally.

The preceding characters define a natural genus. The following are also common to the species: The nostrils are lateral. The postnasals vary. There are either one or two; if the latter, one may be directly above the other, or the second may be both behind and above the first. The head is covered with ossified plates concealing the muscles and with an external epidermis. The tongue is thick, elongate, cordate or arrow-shaped, slightly notched anteriorly, and quite homogeneously squamous throughout. The flap covering the anus is margined behind by two large plates, with smaller ones on either side.

Osteology.—For the determination of the skeletal characters of this genus I have skeletons of the *E. obsoletus* and *E. quinquelineatus* from the national collection.

The premaxillary is split as in other Scincidæ, and the halves are in the closest contact. The common spine is rather elongate, while the palatal suture is simply emarginate. The nasals are not shortened, and are distinct. The frontal is double, and is simply grooved on the middle line below. The parietal is single, and is pierced by the pineal foramen at about its middle. The parietoquadrate arch is well elevated. The supraoccipital is loosely articulated, presenting a truncate median process toward, but not to, a median notch of the parietal. Exoccipitals distinct by suture. Prefrontal rather large, not sending posteriorly a superciliary process, and not produced far above the orbit. Lachrymal small; not, or very little, visible on external facial surface, and reached by a long internal process of the jugal. External surface of jugal separated widely from prefrontal, its postorbital portion much longer, slender, and rising to meet the postfrontal. The latter is large and unequally V-shaped, the posterior limb broad and covering the temporal fossa between the parietal and supratemporal bones, with more or less of a fissure next the parietal posteriorly. Postfrontal a splint separating the jugal and supratemporal from the postfrontal. Supratemporal well produced anteriorly, and in contact with the parietoquadrate arch for the posterior two-thirds the length of the latter. Quadrate with one, a deep external, conch. The vomers are elongate, and also expanded laterally, passing above the prominent palatine laminae of the maxillary bones. They are in close apposition on the median line, but are so swollen longitudinally as to leave a groove at the common suture. The longitudinal ribs terminate in a pair of appressed hooks, which look downward and backward at the posterior extremities of the bones. The vomerine branch of the palatine is not

quite as long as the maxillary branch, and is on a superior plane, being in close contact with its mate on the middle line, and forming with the maxillary plate a half tube opening inward. Pterygoids not very wide, gradually narrowing to the posterior rod, which is openly grooved on the inner side. The basiptyergoid processes overlap the entire width of the internal face. Ectopterygoid reaching maxillary and jugal, but not palatine; little deflected posteriorly. Presphenoid not ossified; sphenoid distinguished from basioccipital by suture. Latter with subconic descending lateral processes, which inclose a deep fossa on the external side. Postoptic small, simple, crescentic. Petrosal extended well in advance of semicircular canal above; subforaminal portion still more produced, bounding a down looking open groove. Parietal sending downward a rather elongate process in front of petrosal. Epiptyergoid originating opposite basiptyergoid below, and resting above on the descending process of the parietal and the anterior margin of the petrosal. Occipital condyle tripartite.

Meckel's cartilage exposed from the anteriorly placed splenial foramen. Coronoid a little produced anteriorly on external face of ramus, not at all posteriorly. Surangular and articular distinct; angle flat, rounded, not produced or angular inward. Dentary produced as far posteriorly as coronoid; splenial rather elongate (forming the inferior border of Meckel's groove in *E. obsoletus*).

In the hyoid system, *E. quinquelineatus* presents a short second ceratobranchial. The first ceratobranchial has a cartilaginous terminal segment, as has also the ceratohyal. The latter is of moderate length, is without expansions, and is articulated with the extremity of the rather short hypobranchial. There is a large free epibranchial, which commences near the free extremity of the second ceratobranchial, and curving backward, outward and then forward, terminates nearly opposite the middle of the ceratohyal.

The cervical intercentra in the *E. obsoletus* number four, and those of the *E. quinquelineatus* three, posterior to that of the atlas. There is no zygosphen. The caudal diapophyses are well developed at the base of the series, and are split lengthwise at the middle and distal part of the series by the segmentation of the vertebræ. Neural spine single at posterior extremity of neural arch.

The suprascapula is expanded anteroposteriorly, and the scapula is rather elongate. The latter has no proscapula, while the coronoid has one emargination. The sternum has a small fontanelle posteriorly placed. There are three costal articulations and a xiphoid rod with two ribs. The latter is in close apposition to its mate, and is expanded outward at the junction of the first hæmapophysis.

The ilium has no *angulus cristæ*, and the acetabulum is entire. The pubes converge at a subacute angle, and the small pectineal process is nearer the proximal extremity, and is turned downward. The ischia are subtransverse, and present a wide emargination posteriorly, since the *processus tuberosus* is near the acetabulum.

Besides the family characters, this genus is well distinguished among American lizards by the divided frontal; the overroofing the temporal fossa by the postfrontal and supratemporal; the descending process of the parietal; forms of the xiphoid rods, and forms of the pelvic bones.

In the latest enumeration of the species of this genus, that of Boulenger, thirty-one species are included. These are distributed as follows:

North America.....	16
Mexico	6
Palaearctic Region (North Africa).....	1
Palaearctic Region (Asia).....	7
Southwest Asia.....	1
Total.....	31

For purposes of analysis, the North American species may be arranged in four groups, which have the following characters:

A postnasal and one mental plate.....	I
A postnasal and two mental plates	II
No postnasal and two mental plates	III
No postnasal and one mental plate	IV

It may be also stated here that all the species have four supraorbital plates except *E. egregius*, which has but three. Also that *E. longirostris* has more numerous scales than any other species, as they are in 36-34 rows; while in *E. egregius* the number of scale rows is smaller than in any species, reaching only twenty-two.

The form of the postnasal plate presents considerable variation in some species. This is especially the case in *E. multivirgatus*, where it may or may not reach the supranasal, and is sometimes directly under the prefrontal. The opposite sides are sometimes slightly different. In some species with two mentals they may be sometimes abnormally fused together.

All the North American skinks lose these distinctive marks of color with age. All are dark, nearly black, when young, varied with white lines or spots, which leave a trace of their presence when old. Three of the labials, the upper especially, are black, with white centers. There is always retained a dusky border to the lateral edges. If the edge of the upper jaw be white the character is never lost, the labials never having darker lateral borders. The light lines in increasing age generally remain for a time and are bordered by blackish or dark brown, the interspaces generally becoming light olive. Even these, however, gradually disappear, and the scales generally are olivaceous above, with dusky borders, especially where originally dark colored.

The following arrangement may be considered as defining the species with two unequal postnasals by the color of the young:

- A. Upper labials plain whitish; ground color black above, bluish beneath; beneath head white.
 1. Five white lines, all on adjacent edges of scales, the middle bifurcating on the head..... *E. quinquelineatus*.

2. Four white lines, the upper on either side on adjacent edges of scales and separated by two rows *E. skiltonianus*.
3. Five white lines, the two lateral along the centers of single rows. Median line not bifurcating anteriorly *E. leptogrammus*.
- B. Upper labials spotted with white; not continuously of this color. General color black.
 4. Five very obsolete whitish lines, the upper lateral on adjacent edges of two rows, separated by six rows. A faint continuous line on the side of head above. Tip and sides of chin plain whitish. Spots on labials not closed beneath. Sides of neck scarcely spotted *E. obsoletus*.
 5. No whitish lines whatever. Labials and plates on side of head, beneath, and above all black, with a rounded central spot of white. Two short lines of white spots on each side of the neck *E. guttulatus*.

The North American species of *Eumeces* may be distinguished in detail as follows:

DIVISION I.

- Hind legs applied twice forward reaching end of snout. Scales in from 36 to 42 rows, in oblique series on the sides; four supraorbitals. Brown, with two white lateral streaks inclosing a brown band; a light line on each side of top of head *E. longirostris* Cope.
- Hind legs less than half head and body; scales in 28 rows, in horizontal lines on the sides; four supraorbitals; two pairs of nuchals; five longitudinal pale stripes, the dorsal vanishing; sides black *E. callicephalus* Bocourt.

DIVISION II.

- A. Postnasal larger, in full contact with the supranasal.

Hind leg applied twice forward, reaching the tip of snout; and contained two and one-third times (head four and one-half times) in head and body; hind leg from knee not three times. Fifth hind toe longer than second. Head depressed; four and one-half times in head and body. Scales in young black, with from 28 to 32 rows; five equidistant white lines, the two lateral each on adjacent edges of two rows of scales. A white line behind the thigh. The upper stripes separated by four or six whole rows of scales. With age the dorsal stripe first becoming indistinct; the color more olivaceous above. Males with head very broad behind; reddish. The color of body more or less plain olive *E. quinquelineatus* Linnaeus.

Hind legs applied twice forward reach to the ear; contained over two and one-half times in head and body; from knee, three and one-half times; head, four and one-half times. Fifth hind toe shorter than second; its free portion a little more than half the side of head. Scales in 28 rows. Young black, with two rows of rounded bluish white dots on each side the head and another on each side the chin. With increasing age the color more olivaceous above; the scales each with a dusky margin; beneath, plain and lighter.

E. guttulatus Hallowell.

Limbs short; hind legs applied twice forward reach to the insertion of the arm anteriorly; applied thrice, to the nose. Contained three times in head and body; from knee, four and one-third times; head, five times. Fifth hind toe shorter than second, its free portion less than half the head to ear. Scales in 28 rows, the laterals smaller and in oblique series. Adult, light olive above; each scale edged laterally, less distinctly behind with darker; beneath, greenish white. Labials edged laterally with dusky. (Postnasal sometimes wanting) *E. obsoletus* Baird and Girard.

Hind legs applied twice forward, falling between arm and ear. Contained two and one-half to three times in head and body; head, about five times;

hind leg from knee, three and one-half times. Fifth hind toe about equal to second; free part of longest nearly three-fourths inch on the side of head. Scales in 26 rows. Young, olive above, with two white lines on each side, embracing a black band. The upper are each on adjacent edges of two rows of scales, margined internally by black, and separated by two plain olive rows. Under parts white. No trace of dorsal white line, nor on thigh behind. Ground color sometimes all black. With age the stripes disappear to a great extent *E. skiltonianus* Baird and Girard.

Head short, appressed limbs meeting on side. Hind legs applied twice forward, reach midway from arm to ear; contained threetimes in head and body; hind leg from knee, four times; head, four and one half times. Fifth hind toe shorter than second; the free portion of longest two-fifths the side of head. Distance between centers of insertion of fore and hind legs nearly twice that from center of fore leg to snout. Scales in 26 rows. Internasal equal prefrontal. Young dark olive, black above, black on the sides, blue beneath and on the tail. Five very narrow whitish dotted lines, the two lateral on the centers of single rows of scales; the two dorsal margined narrowly by almost inappreciable black, and their rows separated by four, all lighter in the centers. Becoming lighter olive with age..... *E. leptogrammus* Baird.

Appressed limbs separated by a space less than length of fore foot. Internasal plate smaller than prefrontals; rostral elevated. Scales in 24 rows. Three dark bands on each side of the middle line; no lateral light bands; size medium *E. epipleurotus* Cope.

B. Postnasal small, more or less separated from contact with the supranasal by the prefrontal.

Head short, conical, contained at least five times in head and body, as is the hind leg from knee also. Hind leg short; when applied twice forward falling behind the fore legs. Fifth toe shorter than second. Vertical and frontal plates often in contact. Distance between centers of insertion of fore and hind legs twice that from center of fore leg to snout. Scales in 24 rows. Light olive; paler beneath. A broad median dorsal light band, bordered on each side by five dark and four light stripes; the first and fourth dark stripes broadest; the second light stripe in the middle of the third row of scales, and bordering the head, but defining no spots on sides of labials. Sometimes unicolor *E. multivirgatus* Hallowell.

DIVISION III.

A. Three supraorbital plates; internasal in contact with loreals.

Posterior edge of postnasal before that of second labial. Scales of body in about 22 rows. Ear openings very small. Reddish ash or gray, with two white lines on each side margined with dusky, and traces of a third; all on the centers of single rows. Upper lateral lines separated by two plain rows. Beneath reddish white *E. egregius* Baird.

B. Four supraorbital plates; loreal not separating the supranasals and prefrontals, which meet and inclose the small internasal.

Scales in 28 rows; olive above, with four equidistant and equal dark stripes on adjacent half rows of scales, the two inner sometimes effaced. Sides with two narrow white lines, on the centers of single rows of scales embracing a black stripe, and margined above and below by black; the black upper margin one of the dorsal stripes mentioned; the interval of the two upper lateral stripes six rows of scales; lower lateral stripe passing along upper edge of ear. Beneath light greenish *E. septentrionalis* Baird.

DIVISION IV.

A. Four supraocular plates.

1. Loreal plate elevated, extending up to the rather longitudinal rhomboid internasal.

Posterior edge of loreal plate above the middle of second labial; mental plate long and pentagonal. Appressed limbs overlapping. Scales of body in 24 rows. Dark olive green above. Sides with 2 narrow white stripes, the upper separated by 4 rows of olive scales; their interspace and a narrow margin above coal black or gray. Beneath greenish livid, the tip of chin white. Upper labials dusky with white stripe..... *E. anthracinus* Baird.

Form stout; appressed limbs overlapping by a little; scales in 26 rows. Above blackish olive; below green; a black lateral band with a pale border above and below..... *E. pluvialis* Cope.

Form elongate; appressed limbs separated by length of anterior limb. Tail large. Scales in 26 rows. Light brown, with a dark lateral band bordered by paler above and below..... *E. pachyurus* Cope.

2. Loreal low, in contact with the widely transverse interfrontonasal.

α External parietal separated from seventh labial by temporal scales.

Larger; 28 rows of scales; appressed limbs overlapping extensively; sides black, head reddish..... *E. sumichrasti* Cope.

Posterior edge of loreal in line with that of second labial. Large plate at end of chin divided transversely. Scales of body in 28 rows. Light olive green above. Sides with 2 yellowish lines, the upper not bordered above with dusky, and separated by 6 rows of olive scales. Sides rather darker olive. Beneath olive green, more yellowish under the head. Upper labials pure yellowish..... *E. tetragrammus* Baird.

Similar in form to last. Body cylindrical; color entirely black everywhere..... var. *funebrosus*.

Posterior edge of loreal marking middle of second upper labial; post-symphysal undivided; appressed limbs meeting. Scales in 26 rows. Head colored above, light olive below; 2 light lines extend from side of head to a little behind axilla..... *E. brevilineatus* Cope.

Scales in 22 to 24 rows; appressed limbs widely separated; parietals separated by interparietals; brown, with a lateral black band yellow bordered above and below; sometimes a median pale stripe.

E. lynce Wiegmann.

α External parietal not separated from eighth superior labial by temporals. Scales in 22 to 24 rows; appressed hind limbs widely separated; parietals separated by interparietal; brown, with a lateral black band pale-bordered above and below; sometimes a pale median dorsal stripe..... *E. brevicrostris* Günther.

Three supraocular plates.

External parietals separated from seventh labial by temporal scales; parietals separated by interparietal; appressed limbs widely separated; scales 22 to 24 rows; side black, with pale borders and pale median stripe.

E. fuscicrostris Cope.

External parietals broadly in contact with seventh labial; parietal inclosed behind by interparietal; appressed limbs widely separated; scales 22 rows; sides dark brown, back golden brown *E. dugèsi* Thominot.

EUMECES LONGIROSTRIS Cope.

Eumeces longirostris COPE, Check-list N. Amer. Batr. Rept., 1875, p. 45.—GARMAN, Bull. U. S. Nat. Mus., No. 25, 1884, p. 287.—BOULENGER, Cat. Liz. Brit. Mus., 1887, III, p. 368.

Plestiodon longirostris COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 313.

Form much as in *E. quinquelineatus*, the tail a little thicker, the muzzle more narrow and elongate. The anterior extremity extended forward reaches the anterior border of the orbit; the posterior reaches to beyond the appressed elbow, but not to the axilla. Rostral plate as high as broad, less depressed than in *E. quinquelineatus*; nasal small; nasofrenal smaller, trapezoid; anterior frenal as long as high. Eight superior labial plates, the sixth and seventh bordering the inferior palpebra. Each occipital bounded by two temporals (sometimes con-

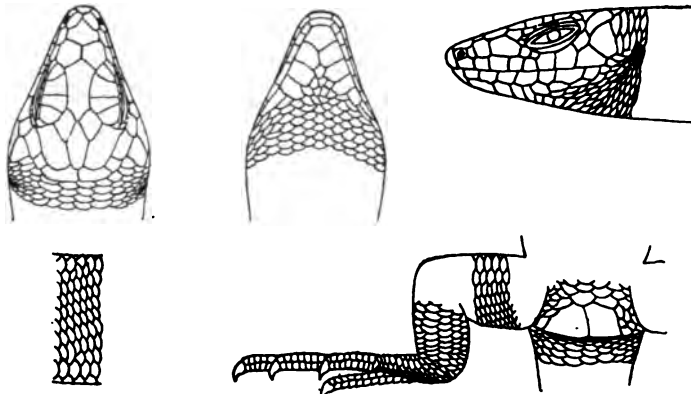


Fig. 124.

EUMECES LONGIROSTRIS COPE.

× 2.

Bermuda Islands.

Collection of E. D. Cope.

fluent) and a postoccipital; the anterior temporal bounded by two inferior temporals, the anterior small, the posterior larger than the eighth upper labial. Interoccipital large, rounded posteriorly, very acute anteriorly. Frontoparietal plates geminiform, in contact by their inner angles. Supraoculars four; anterior supraocular small, barely or not in contact with the frontonasal. Inferior palpebra granular; a series of six to eight vertical scales beneath the marginal row. Supranasals large, considerably in contact; internasal transverse, subtruncate posteriorly; frontonasals as long or more frequently longer than broad, extensively in contact. Frontal elongate, in front obtuse, posteriorly acute angled. Inferior labials, seven; symphyseal deeper than in *E. quinquelineatus*; one large seven-sided mental in contact with two labials on each side, two infralabials posteriorly, and the symphyseal anteriorly. Three infralabials on each side, the anterior

not separated by a postmental. Three slightly prominent granules upon the superior part of anterior auricular border. Digits compressed; of the posterior the fourth has twice the extent of the fifth. Sole tuberculous externally and internally; medially granular; palm tuberculous posteriorly. Scales small, especially upon the sides; rows from thirty-nine to forty-two. Preanal plates, four; the median very large, the exterior very small. Total length, 162 mm.; tail, 95 mm.

Color above, from rusty to ashy brown, paler on the tail. A white line begins at the anterior angle of the orbit, and extending above the latter reaches as far as the crural region. It is margined with black superiorly, and separated from that of the opposite side by eight rows of scales. Beneath it the sides are black or brownish for a width of three and a half scales, beneath which shade is another white line extending from beneath the orbit to the groin. The dark color of the sides extends upon the tail for one third its length. The under surface of this member, of the extremities and belly, greenish blue; throat and chin yellowish. In younger specimens a light line upon each canthus rostralis is analagous to those which unite and form the median dorsal band in *E. quinquelineatus*. There are nearly ten more rows of scales in this species than in *E. quinquelineatus*, and there is only one mental. The latter species has six preanal plates, of which the median pair is not so disproportionately large; also the frenals and nasofrenal are narrow and erect.

We are informed by Mr. J. M. Jones, in his Naturalist in Bermuda, that a species of "Scincus" inhabits the islands, and that it is the only indigenous true reptile. He notices its resemblance to *E. quinquelineatus* ("*S. fasciatus*") of the United States, and gives a description of an old male specimen.

Eumeces longirostris Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
12129	1	Bermuda	G. Brown Goode	Alcoholic.
4737		do	Hon. J. H. Parrell	do.

EUMECES QUINQUELINEATUS Linnæus.

Eumeces quinquelineatus BOCOURT, Miss. Sci. Mex., Rept., 1879, p. 426, pl. xxii E, fig. 10.—SMITH, Geol. Surv. Ohio, Zool., IV, p. 650.—PETERS, Monatsb. k. Akad. Berlin, 1864, p. 49.

Eumeces fasciatus COPE, Check-list N. Amer. Batr. Rept., 1875, p. 45.—BOULENGER, Cat. Liz. Brit. Mus., 1887, III, p. 370.

Lacerta quinquelineata LINNÆUS, Syst. Nat., 12th ed., I, 1766, p. 366.—SHAW, Gen. Zool., III, Pt. 1, 1800, p. 24.—GREEN, Journ. Acad. Nat. Sci. Phila., IV, Pt. 2, 1818, p. 284, pl. xvi, fig. 2.

Lacerta fasciata LINNÆUS, Syst. Nat., 12th ed., I, 1766, p. 369.—SHAW, Gen. Zool., III, Pt. 1, 1800, p. 241.

Lacerta tristata LATREILLE, Hist. Nat. Rept., I, p. 248.

- Scincus laticeps* SCHNEIDER, Hist. Amph., II, 1801, p. 189.—DAUDIN, Rept., IV, 1802-1803, p. 301.
- Scincus quinquelineatus* SCHNEIDER, Hist. Amph., 1801, p. 201.—LATREILLE, Hist. Rept., II, 1801, p. 74, fig. 24.—DAUDIN, Rept., IV, p. 272, pl. LV, fig. 1.—MERMER, Tent. Syst. Amph., 1821, p. 72.—KÜHL, Beitr. z. Zool. u. Vergl. Anat., p. 128.—HARLAN, Journ. Acad. Nat. Sci. Phila., VI, 1827, p. 10; Phys. Med. Res., p. 138.—HOLBROOK, N. Am. Herp., II, 1842, p. 121, pl. XVII.
- Scincus tristatus* DAUDIN, Rept., IV, p. 296.
- Scincus erythrocephalus* GILLIAMS, Journ. Acad. Nat. Sci. Phila., I, 1818, p. 461, pl. XVIII, fig. 2.—HARLAN, Journ. Acad. Nat. Sci. Phila., VI, 1827, p. 11; Phys. Med. Res., p. 139.—HOLBROOK, N. Amer. Herp., II, 1842, p. 101, pl. XXII.
- Scincus bicolor* HARLAN, Journ. Acad. Nat. Sci. Phila., IV, 1824, p. 286, pl. XVIII, fig. 1; Phys. Med. Res., p. 139.—CUVIER, Règne. Anim., 2d ed., II, 1829, p. 62.
- Scincus americanus* HARLAN, Phys. Med. Res., p. 139.
- Tiliqua quinquelineata* GRAY, Griffith's Cuvier's Anim. Kingd., IX, Syn., 1831, p. 69.
- Tiliqua bicolor* GRAY, Griffith's Cuvier's Anim. Kingd., IX, Syn., 1831, p. 69.
- Plestiodon laticeps* GRAY, Cat. Liz., 1845, p. 90.—DUMÉRIL and BIBRON, Erp. Gén., V, 1839, p. 705.—HOLBROOK, N. Amer. Herp., 2d ed., p. 121, pl. XVII.
- Plestiodon quinquelineatus* DUMÉRIL and BIBRON, part, Erp. Gén., V, 1839, p. 707.—GRAY, Cat. Liz. Brit. Mus., 1845, p. 91.—GRAVENHORST, N. Act. Ac. Leop. Carol., XXIII, 1851, I, p. 350, pl. XXXV.
- Scincus fasciatus* HOLBROOK, N. Am. Herp., 2d ed., p. 127, pl. XVIII.—DE KAY, New York Faun., III, p. 29, pl. VIII, fig. 17.
- Eumeces laticeps* PETERS, Monatsb. k. Akad. Wiss. Berlin, 1864, p. 49.—BOCOURT, Miss. Sci. Mex., Rept. 1879, p. 424, pl. XXII D, fig. 6.
- Mabuya quinquelineata* FITZINGER, N. Class Rept. Vienna, 1826, p. 52.
- Euprepis quinquelineata* and *fasciata* WAGLER, Syst. Amph., 1830, p. 162.
- Euprepis de Castesby* COCTEAU, Tabl. Synopt. Scinc., 1837.
- Plestiodon quinquelineatus* and *fasciatus* HOLBROOK, N. Amer. Herp., II, 1842, pp. 121, 127, pls. XVII, XVIII.

Plates of head as in *E. skiltonianus*. The dorsal scales of equal width, or the ventral not larger. Dorsal scales 28 to 34, and about 55 from head to tail. Tail one and one-fourth or one and one-half times the body when perfect. Fore leg from elbow longer than head to ear, which is contained about four or four and one-half times in head and body. Hind legs, applied twice forward, reach to or a little beyond the ear; contained two and one-half times or less in from knee, three to three and one-half times in head and body. Free portion of long hind toe nearly three-fourths the side of head to ear; the fifth toe decidedly longer than the second.

Coloration. 1. Black above, including the head, with five equidistant narrow whitish stripes, a dorsal and two lateral; the median bifurcating at the occiput, the branches uniting at the rostrum. Each line usually on adjacent edges of the rows of scales (occupying half or third) and separated by one, sometimes two, rows of the ground color ("*fasciatus*").

2. The rest of the scales through which the three middle stripes run, black; the intervening scales light olive; the cephalic white line then fainter, and next the dorsal, until the whole space between the upper lateral stripes is olivaceous, with four dusky lines of dots along the middle of scales, head becoming reddish and wider ("*quinquelineatus*").

3. Lateral stripes and dusky band becoming obliterated, first the upper then the lower, the head swelling still more; finally the body uniform greenish or reddish olive, whitish beneath, the head as broad as long and bright brick red.

Of these stages the first is confined to very young (less than 50 mm. or 62.5 mm.). The red and broad-headed individuals, without distinct stripes, of whatever size, are males; the largest, with narrow head and distinct stripes, are females.

More northern specimens do not appear to assume the red head and plain coloration.

In Cat. No. 3129 the plates of the head are much as described in *P. skiltonianus*. The legs are much longer, the hinder applied twice for-

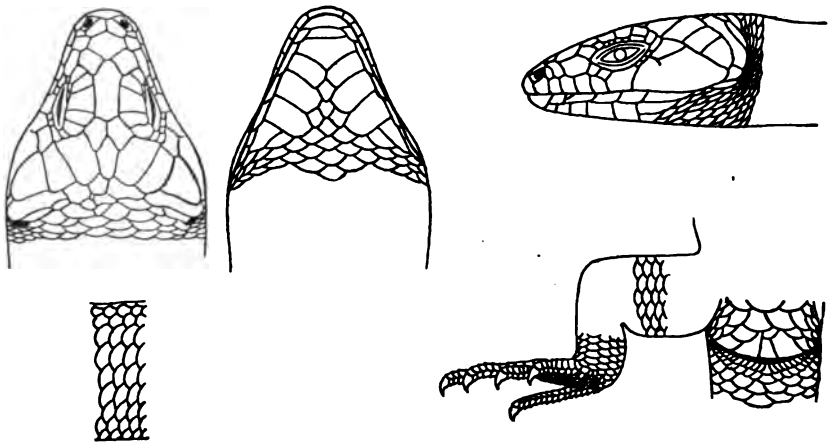


Fig. 125.

EUMECES QUINQUELINEATUS LINNÆUS.

Adult male.

= 1.

Texas.

Cat. No. 9234, U.S.N.M.

ward reaching a little beyond the eye; from knee contained three times in head and body or reaching halfway from root, two and one-sixth from head to between fore legs. Fore leg from elbow one and one-fifth times the head to ear, which is contained four and one-half times in head and body, which again is contained one and one-half times in the tail. The width of head is two-thirds the length to ear. The body at the middle is encircled by twenty-eight rows of scales, and there are fifty-six from head to tail.

Other specimens, however, vary considerably from this standard. Thus the number of dorsal rows appears to vary up to thirty-four, the highest I have yet observed, every intermediate number occurring from twenty-eight, the smallest. The longitudinal dorsal number is generally fifty-five or fifty-six. With advancing age the head becomes

broadier behind, until in the "*laticeps*" its width is equal to the length above, and laterally to the distance from nostril to ear. The unusual expansion is chiefly in the cheeks, which are wider from above downward, and are completely ossified.

The general color of head and body above is a dark olive green, with five nearly or quite equidistant bluish or greenish white stripes, one median and two lateral on each side, becoming blue on the tail and extending to the tip. The stripes are all of equal width, a little more than one-third the width of their intervals, and occupy rather less than the adjacent halves of contiguous rows of scales, sometimes only one-third. Between each stripe is a row of perfectly plain scales; the remainder of the white-streaked rows being black. The interval between the two lateral white stripes is black; the others are all margined by a line of black on the rest of the row of scales as stated, leaving on the back two dorsal rows, one on each side the median line, dark olive. Beneath the lower white stripe is an obscure dusky streak. The under parts are light salmon, tinged with bluish on the belly and sides of tail.

The lowest lateral stripe begins on the upper labials and runs through the ear; the upper starts on the *canthus rostralis* a little in front of the eye. The median bifurcates at the occiput, sending two branches forward along the edge of the vertical, and uniting in a gentle curve at the rostral.

There is a white line down the posterior face of the thigh and another on the anterior face, both confluent with the lower lateral stripe, and becoming more broken on the tibial portion. The fore legs appear slightly spotted also.

In some specimens, as Cat. No. 3129*b*, the white lateral stripes above the fore leg run obliquely from one row of scales to another; one upper lateral stripe passes along the middle of the fourth row of scales from the median line of back, leaving two olive-colored rows, while its fellow on the opposite side is more as described.

In many, in fact, in most specimens, the light stripe on the anterior face of the thigh is wanting. The upper lateral stripe does not always bound the exterior of the third row of scales from the middle of the back, but is frequently confined to the fourth, especially posteriorly, the line sometimes, as already stated, crossing from one row to the other. The ground color is sometimes entirely black; the stripes yellowish or golden.

I have in the preceding paragraphs confined my attention to the very young specimens usually known as the *Eumeces fasciatus*. With increasing age the stripes on the head become obscure and then disappear entirely, the head assuming more or less of a reddish tinge. The cheeks expand and become tinged, especially below and behind, where the large plates are ultimately folded into the cavity of the ear and the two or three floating triangular scales affixed along its anterior edge

are completely concealed or sometimes more or less blunted, contracted, or obliterated. With the disappearance of the cephalic stripes the median dorsal first becomes obscure; the ground color changes from black or narrow dorsal olive stripes to predominant light olivaceous. For a considerable time the black on the sides remains distinct and continuous, but ultimately is reduced to dusky margins to the scales. Sometimes the lateral whitish stripes disappear or are very obsolete, the black stripe remaining distinct; or the reverse may be the case. The lateral light lines are, however, quite late to disappear entirely. There is often a trace of the original black above in a line of dusky dots down the middle of the two dorsal rows of scales, and that of the third or fourth row from the central line of the back, formerly continuous stripes bordering the white. By degrees the lateral stripes become more and more obsolete, until there is only the faintest trace or they have disappeared entirely, leaving the body of a uniform greenish or reddish olive above and a light brick-red head as broad as long. The lowest lateral white stripe can usually be detected on oldest specimens as well as some of the dusky of the sides; the scales of the back, however, become entirely uniform.

In Cat. No. 4136 there is a distinct whitish stripe between the legs below what is ordinarily the lowest, making three on each side, the dorsal wanting. This is seen more or less distinctly in other specimens, as Cat. No. 3178, though usually wanting. The various changes described do not appear to progress uniformly in all specimens. Sometimes a series of specimens of the same size will exhibit all the stages, except the earliest.

Professor Baird has shown that the *Scincus erythrocephalus*, *quinquelineatus*, and *fasciatus* are forms of the same species, the first name having been given to old males.

From the preceding remarks it will be seen that I have adopted his opinion, combining in one all the three species described by Dr. Holbrook as inhabiting the United States. This I have only done after a protracted examination of a large series of specimens from all parts of the United States. I have failed to find any constant distinctions in the external structure and relative proportions, while the differences of coloration are only those readily attributable to age and sex. It is well known that the characteristic markings of the skinks are most appreciable in the young. Now, in the present case none except the very largest have the coloration of *erythrocephalus*, none except the middle and the largest size (females) that of *quinquelineatus*, while every one before me with a head and body of less than 2 or 2½ inches agrees exactly in coloration with the most typical *fasciatus*. To sum up the whole case, I feel very confident that the three (or four, including Dr. Hallowell's *P. vittigerum*?) supposed species in reality constitute but one; that the species attains a much larger size in the more Southern States than the Northern, there going through all the stages of color-

tion, and that the farther north the more is this restricted to the primary pattern.

Furthermore, it is probable, or even almost certain, that the females retain their stripes and other markings longer than the males, and have a much less tendency, if they exhibit it at all, to reddening and widening of the head, which would explain the differences in size of specimens otherwise similarly colored. It is almost certain that females never entirely lose their stripes and never assume the very wide head. A series (Cat. No. 4137) of three from Tyree Springs, Tennessee, though evidently the same species and of the same size (body and head nearly 4 inches) represents very fairly the so-called *P. erythrocephalus* and *quinquelineatus*, the former being males, the latter female. As far as I have made anatomical examination, all the largest specimens (head and body 4 inches) of those with narrow head and distinct stripes (as Cat. No. 4136) are females; all those of same or even less size, with very broad, red head and obscure markings (as Cat. No. 4138) are males, and I have no doubt this may be taken as a rule in the present case.

A figure of the details of the female is No. 3, page 177, of this book. The specimen is from Florida.

The most northern, as at the same time the smallest, specimens having more the character of *P. laticeps* or *erythrocephalus* than that of the others, is in bottle Cat. No. 3150, from Carlisle. The head and body of these barely measure 3 inches, and they were captured by myself in the same locality and at the same time with others of the same size agreeing with *S. quinquelineatus*. The former are males, the latter females, as shown by actual examination.

The *Plestiodon vittigerum* of Hallowell from Michigau¹ belongs to the middle stage of this species, var. *polygrammus*. In a large number of small skinks with median white line before me there is one which, in most respects like the small blue skinks, differs in having the fine bluish white lines on a black ground very narrow; the hind legs uniform black without any stripe. There is a third lateral stripe on each side, between the fore and hind legs, less distinct than the other, and a short light stripe on each side the median one on the back of the neck. This is along the adjacent edges of the first and second row of scales from the median line, the inner edge of this first row involved in the median stripe. The posterior extremity of the oval light outline on the head above, instead of being connected with the end of the dorsal stripe as its bifurcation, has the two branches curved outward, as a quarter circle, and connecting with the two supplementary short cervical stripes and not at all with the median. The belly is bluish, becoming white on the under surface of head; the rostral plate and sides of head anterior to the eye are white.

I do not venture, in the absence of more specimens, to consider this as a distinct species; it, however, is markedly different in the character

¹ Proc. Acad. Nat. Sci. Phila., VIII, 1856, p. 310.

of its stripes from any other before me. Its locality (Colonels Island, off the coast of Georgia, and not on the main land) is to be duly considered.

The *Eumeces quinquelineatus* is distributed throughout the eastern district, with the exception of the Canadian and Hudsonian subdistricts, and throughout the austroriparian, excepting the Texan district. The most northern locality from which I have seen a specimen is Michigan, as pointed out by Hallowell. Of its occurrence in Massachusetts, Prof. J. A. Allen wrote in 1868:

A specimen is said by Dr. Storer to have been sent him from Barre, and to have been found in a mud hole in that place by Dr. Joseph N. Bates. Mr. Linsley¹ gives it as occurring occasionally near New Haven. Dr. De Kay says it is not uncommon in the southern counties of the State of New York, but Massachusetts is quite beyond its usual northern range, and it can be expected to occur there but rarely.

It is rare in eastern Pennsylvania and New Jersey. In Texas I have it from Dallas, but have not seen or heard of it west of that locality.

In its movements the *Eumeces quinquelineatus* is active, but not nearly as much so as the *Sceloporus undulatus* of the same region. I kept a specimen in confinement for a considerable time. After it had been without food I introduced into the vivarium with it a number of wood lice (*Oniscus* sp.). Soon after, I observed the *Eumeces* performing extraordinary movements, leaping about, turning somersaults, and rolling over. It soon became quiescent and died. On examination I found in its alimentary canal aggregations of the shells of the wood lice, and at other points bladder-like expansions of the intestine, inclosed by constrictions. The contents of the canal were fetid, and it was apparent that the lizard had gorged itself with the *Onisci*, which it had been unable to pass. The result was decomposition, accumulations of gas, and death from wind colic. The gyrations of the reptile render it evident that the disorder was no less painful to it than it is to mammals under the same conditions.

Systematic authors generally have given this species as an inhabitant of Japan, and commented upon the fact as a remarkable exception to the usual laws of geographical distribution. I have examined a specimen from Simoda, Japan, and I have not the slightest hesitation in pronouncing the species distinct. The postnasal is divided into two plates, one above the other, instead of one, as in *E. quinquelineatus*, together forming a narrow and high plate, as in *E. septentrionalis*. There is but one postmental plate. The frontal is smaller and scarcely or not at all in contact with the postnasal. The scales are much larger; the ten central above abruptly larger than the lateral. There are 24 or 25 encircling the body. The upper lateral stripe runs through the middle of the third row of scales from the central line (nearest the upper edge) and the two upper lateral are separated by but four rows of scales. In *quinquelineatus* the upper white stripe is generally along the adja-

¹ Storer's Report, p. 41.

cent edges of the fourth and fifth row, and six rows intervene between them instead of the four. There is no trace of the white stripe along the posterior face of the thigh seen in *quinquelineatus*. Other differences might be readily found, but these are quite enough to distinguish two species. In a specimen from Loo Choo there is but one postnasal, from the fusion of the two seen in the Simoda specimen. Dr. Hallowell has named one of the Loo Choo specimens above referred to *Plestiodon marginatus*, which is *Eumeces marginatus* of Boulenger's Catalogue.

Eumeces quinquelineatus Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
3122	2	(?)		(?)	Alcoholic.
3129	3	Virginia		C. W. E	Type.
3159	1	Arkansas River		Dr. Woodhouse	
3190	1	Fort Pierre, Nebraska		Dr. Evans	
4135	1	Eastern Nova Scotia			
3125	1	Bridgers Pass	Aug. 18, 1856	Lieut. Bryan	
3143	1	West Northfield, Illinois		R. Kennicott	
3150	4	Carlisle, Pennsylvania		S. F. Baird	
3149	6	West Northfield, Illinois		R. Kennicott	
3176	1	Fort Smith, Arkansas		Dr. Shumard	
4136	1	Indian River, Florida		G. Wurdemann	
3178	2	Charleston, South Carolina			
4137	3	Tyree Springs, Tennessee		Prof. Owen	
3153	1	Brazos River, Texas		Dr. Shumard	
3147	1	Columbus, Georgia		Dr. Geiser	
3155	1	Kansas		S. Army	
4154	1	Roane County, Tennessee		Prof. Mitchell	
4150	2	Tyree Springs, Tennessee		Prof. Owen	
4149	2	New Orleans to Galveston		E. B. Andrius	
4148	1	Gloucester, Virginia		Rev. C. Mann	
4147	3	Anderson, South Carolina		Mrs. Daniel	
4146	1	do		do	
4151	1	Indian River, Florida		G. Wurdemann	
4153	2	Mississippi		Dr. Shumard	
4152	2	Tyree Springs, Tennessee		Prof. Owen	
4145	4	Mississippi, near Natchez		B. L. C. Wallis	
4155	2	Foxburg, Pennsylvania		S. F. Baird	
4163	2	Prairie Mer Rouge		J. Fairie	
4827	1	St. Catharines, Canada		Dr. Beadle	
4156	1	Liberty County, Georgia		Dr. Jones	Var. <i>polygrammus</i> .
6059	1	(?)		(?)	Alcoholic.
5125	5	Southern Illinois		R. Kennicott	
7822	1	Washington, District of Columbia			do.
8193	1	do		P. L. Jouy	do.
8817	3	Franklin County, Tennessee		J. N. B. Scarborough	do.
9232	2	Charleston, South Carolina			do.
4990	2	Abbeville, South Carolina			do.
4217	1	Northern Alabama		W. M. Stewart	do.
4988	2	Eutaw, Alabama		Prof. A. Winchell	do.
8333	5	Kinston, North Carolina			do.
9237	1	Gloucester, Virginia			do.
4873	1	Norfolk, Virginia		Lieut. Couch, U. S. A.	do.
5050	1	Knoxville, Kentucky		Prof. J. H. Mitchell	do.
9238	4	Mississippi		Col. B. L. C. Wallis	do.
9241	4	do		do	do.
4995	1	Aux Plains, Wisconsin		R. Kennicott	do.
4991	1	Indian River, Florida		G. Wurdemann	do.
4706	1	Southern Florida		Dr. J. G. Cooper	do.
4987	1	Prairie Mer Rouge, Louisiana			do.
4989	12	do			do.
5334	1	Anderson, South Carolina			do.
9230	1	Bridgers Pass, Wyoming		W. S. Wood	do.
5132	1	North Carolina		C. B. Adams	do.
6423	2	Newbern, North Carolina		Capt. W. Holden	do.
4996	1	Missouri		Dr. B. F. Shumard	do.
9235	3	St. Louis, Missouri		Dr. G. Englemann	do.
9239	1	Fort Smith, Arkansas		Dr. B. F. Shumard	do.
9234	1	Brazos River, Texas		do	do.
5872	1	Montgomery, Alabama	July 13, 1876	Dr. T. H. Bean	do.
9231	3	Gila River, Arizona	—, 1873	Dr. C. G. Newberry	do.

Eumeces quinquelineatus Linnaeus—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
9233	1				Alcoholic.
8801	1	Augusta, Georgia		William Phillips	do.
9236	1	(?)			do.
9240	1	(?)			do.
9242	1	(?)			do.
9953	3	Little Sarasota Bay, Florida.	— —, 1875	Prof. F. B. Meek	do.
9700	2	Arlington, Florida		G. Brown Goode	do.
4998	10	Grand Couteau, Louisiana		St. Charles College	do.
11429	1	Columbia, South Carolina	July —, 1878	E. E. Jackson	do.
12055	3	Mount Carmel, Illinois	— —, 1881	L. M. Turner	do.
12049	4	do	Nov. —, 1881	do.	do.
11877	3	Wheatland, Indiana		R. Ridgway	do.
11865	1	Arlington, Florida	— —, 1878	G. Brown Goode	do.
5732	1	North Carolina		C. B. Adams	do.
8767	1	Belleville, Illinois		Dr. A. Reuss	do.
9052	2	Ferry Landing, Virginia		H. W. Welsner	do.
9418	1	Waukegan, Illinois		J. W. Milner	do.
9744	1	Prince George County, Maryland.		(?)	do.
1159	7	(?)		Clarence Griffin	do.
11843	1	Fort Cobb, Indian Territory.		E. Palmer	do.
11866	1	Arlington, Florida		G. B. Goode	do.
11901	1	Nashville, Georgia		W. J. Taylor	do.
11898	1	do		do.	do.
11902	1	do		do.	do.
11917	1	do		do.	do.
12003	12	Georgiana, Florida		W. Wittfield	do.
12704	1	Lookout Mountain, Tennessee.		W. H. Fox	do.
13257-60	4	New Orleans, Louisiana		Dr. R. W. Shufeldt	do.
13262-5	4	do		do.	do.
14782	1	St. Louis, Missouri		G. Hunter	do.
14113	1	Huntington, Tennessee		E. M. Hawkins	do.
14594	1	Oakley, South Carolina		F. W. Hayward	do.
16884	1	St. Marys, Georgia		C. F. Batchelder	do.
15378-80		New Orleans, Louisiana		Dr. R. W. Shufeldt	
16268		Natural Bridge, Virginia		P. L. Jouy	
17647		Washington, District of Columbia.		Geo. Arthur Quives	
30478		Marshall Hall, Maryland		E. A. Preble	
21491		Hot Springs, Arkansas		H. H. and C. S. Brimley	
22344		Lake Kissimee, Polk County, Florida.		Wm. Palmer	

EUMECES SKILTONIANUS Baird and Girard.

Eumeces skiltonianus COPE, Check-list N. Am. Rept., 1875, p. 45.—BOCOURT, Miss. Sci. Mex., Rept., 1879, p. 433, pls. XXII, A, fig. 3; XXIII, A, fig. 3.—BOULENGER, Cat. Liz. Brit. Mus., 1887, III, p. 373.—STEJNEGER, N. Amer. Fauna, No. 7, Pt. 2, 1893, p. 201.

Plestiodon skiltonianus BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 69; Stansb. Exped. Gr. Salt Lake, 1852, p. 349, pl. iv, figs. 4-6; Rept. U. S. Expl. Surv. R. R., Pt. 4, X, 1859, p. 18.

Eumeces sp. HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1854, p. 95.

Eumeces quadrilineatus HALLOWELL, Rept. U. S. Expl. Surv. R. R., Pt. 4, X, 1859, p. 10, pl. ix, fig. 3.

Eumeces hallowellii BOCOURT, Miss. Sci. Mex., Rept., 1879, p. 435, pl. XXII E, figs. 7, 7a.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., III, 1887, p. 373.

Frontal transversely rhomboid, the lateral corners truncate and in contact with the second postnasal, separating the postfrontals from the two internasals (of the two pairs, the latter about one-half smaller). Nasal between internasal, rostral and anterior half of first labial. Behind it a small, squarish postnasal, nearly equal to it and resting

partly on the second labial; this succeeded by a second, twice its area and height; higher and half as long as the loreal and in contact with both frontals and postfrontals. Upper labials, seven or eight. The two central rows of dorsal scales are abruptly larger than the next. Twenty-four or twenty-six rows of scales around body, and about sixty-three from head to tail.

Young, clear olive, with two white stripes on each side, inclosing a black space, and the upper bordered above by a black line; the lower with one less defined. The stripes on adjacent edges of two rows of scales, the middle of the two lower, stripes ten or twelve scales apart across the back. Back with two median rows of olive scales. Upper stripes involving exterior half or third of the second row from the middle, and not half as wide as their interspace. Legs without stripes;

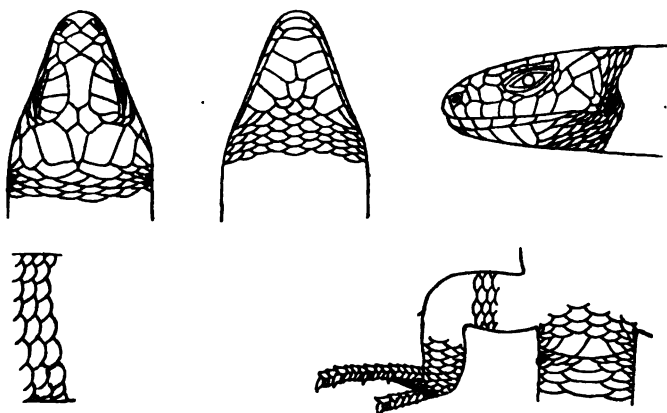


Fig. 126.

EUMECES SKILTONIANUS BAIRD AND GIRARD.

× f.

California.

Cat. No. 11754, U.S.N.M.

with age the stripes become more or less effaced; the head above reddish olive. In variety *amblygrammus* the white stripes broader, occupying adjacent two-thirds of two rows of scales, the upper stripes half the width of their dorsal interspace, which is uniformly black.

Limbs short; hind leg, from knee, contained three and one-half times in head and body. The fifth hind toe is rather shorter than second, the free portion of longest about two-thirds the side of head.

In Cat. No. 3172a, the type, there are twenty-five to twenty-seven rows of scales around the body, varying with the region, and fifty-eight to sixty-three from occiput to above anus. The hind leg reaches forward halfway to the middle of the insertion of the arm; the forelegs only to the gape of the mouth. The hind leg, from knee, is contained about three and two-thirds times in head and body; the head to ear five and one-half times. The arm, from elbow, is about equal to head to ear.

Tail broken at tip, but apparently about one and one-third times the head and body. The tail is strictly tetragonal and equilateral to the end. In nearly all good specimens, however, it is cylindrical.

In Cat. No. 3172*b*, from same locality with the type, but of considerably smaller size, there are twenty-six rows of scales around the body and sixty-three from occiput to anus. The hind leg applied forward twice reaches halfway between the arm and the ear, the forelegs to the gape. The hind leg, from knee, is contained rather less than three and one-half times in the head and body; the head to ear about five times; the tail is trihedral, the base above and smaller than the sides. From this it appears that the older specimens have the body proportionally rather more elongated than in younger; the tail longer.

There appears to be a considerable difference in the size of the limbs, especially the hinder. This is smaller in the type of Dr. Hallowell's *Eumeces quadrilineatus* than in most other specimens. The head never appears to become very broad, not exceeding two-thirds the length to ear.

The prevailing color of this species is a greenish olive above, with four white or greenish-white stripes, the space between the two lateral black, the upper stripe bordered internally with black. The stripes on the back are separated by an interval one and one-half times that between the two lateral. On the back are two central rows of scales of the ground color, each sometimes with a narrow posterior border of dusky or black. The white stripe on either side occupies the outer third (or angular portion) of the adjacent row of scales, and the inner half of the next outer (or of the third from the median line) the inner half of the second row from the median line black, forming the line just mentioned. The black lateral stripe occupies $2\frac{1}{2}$ scales on the sides, succeeded inferiorly by a white stripe two half scales wide, or rather on the lower third of one row and the upper half of the next. Between the centers of the two lower lateral stripes on either side there thus intervene twelve rows of scales. The under parts are of a light salmon color, the belly and sides of the body dull bluish.

Another specimen (Cat. No. 3131) has the lower lateral stripe on one row higher up, leaving but $1\frac{1}{2}$ in the dark part, or ten from its middle to that of the fellow across the back. There are but twenty-four rows of scales around the body. Here, as in the other, the upper white stripe begins on the canthus rostralis, just behind the nostrils but rather indistinct to above the eye. The second begins along the upper labials and runs back through the ear, and above the insertions of the limbs. Both are quite distinct on the tail, where this has not been reproduced, the ground color being rather bluish.

With advancing age the clearness of the markings disappears, and there is at first only a line of black spots on the back on the inner half of the second row of scales from the middle of the back, two full rows intervening between the two. This is a remnant of the black border-

ing internally the upper white stripe, which is faintly traceable. Then comes a dusky lateral stripe, each scale, however, with a little olive at the base. The lower white stripe is very faint. This is the coloration in the type specimen Cat. No. 3172a. In the largest specimen, Cat. No. 3181a, the upper parts are entirely uniform olive, lighter than in the young, the four and five rows from the middle of the back having the scales edged slightly with brown. The middle row of large scales beneath the tail is plain light-salmon color, the line connecting it with the adjacent rows dusky. In old specimens the limbs are shorter, relatively, than in young ones. In the latter, when appressed to the sides, they touch or overlap a little, but in old and large ones they may be separated by a space equal to the length of the hand.

Var. amblygrammus.—A specimen from Fort Humboldt (Cat. No. 166) differs from others before me from California in having the dorsal interspace uniformly and continuously black as well as the sides; the four bluish-white stripes are very sharply defined, the upper from the nostril. The upper lateral stripe occupies the adjacent two-thirds of the second and third rows of scales from middle of back and is half as wide as the black dorsal interspace. In all other specimens the upper light stripe occupies at most only adjacent halves of scales, usually only adjacent thirds (especially above), and the width is one-half the dorsal band, which is always olive edged with black.

I have seen the *Eumeces skiltonianus* from Cape St. Lucas, Lower California, on the south, to near the Canadian boundary on the north. It is quite abundant and is active in its movements, frequently exposing itself in the open sunshine.

Dr. Merriam notes in his report on the Death Valley expedition that "specimens of this small lizard were obtained in the Panamint and Argus ranges in the Great Basin, and in Kern River Valley and the Cañada de las Uvas (near old Fort Tejon) on the coastal slope of the Great Divide in California."

Var. brevipes.—In a large and probably old specimen (Cat. No. 12558) there is but one mental plate, and the limbs are considerably shorter than in the adult of the typical form. The color is also modified in a way which is different from that seen in other adults. Additional specimens are necessary to determine the question of the rank of this form. It diverges, however, so widely from the normal that I describe it under a distinct name.

The limbs, appressed to the sides, do not meet by a space equal to the length of the forearm and hand, which is more than double the space between the limbs in the adults of the typical variety. The hind limb is one-third the length from the groin to the end of the muzzle. The tail is unusually robust, but the extremity is lost in the specimen. In coloration the dorsal ten rows of scales are all alike, dark olive, bordered with brown. There is a pale spot on the outer border of the scales of the third row from the median line on each side, which gives

the impression of an indistinct narrow pale streak. Belly and posterior gular region blue; chin, throat, a crossband at axillæ, and the inferior surfaces of limbs and tail, light yellow. The external border of the broad median row of subcaudal scales (which are twice as wide as those of the adjacent rows) are bordered with plumbeous, forming two narrow streaks. The scales of the upper side of the tail are brown bordered. The dimensions equal those of the largest adults of the usual type.

Eumeces skiltonianus Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3172	2	California .....	.....	Type.
3168	1	do	Lieutenant Williamson .....	.....
3140	1	Oregon City .....	.....	.....
3108	2	Monterey, California	A. S. Taylor .....	.....
3181	2	El Dorado, California	Dr. Boyle .....	.....
3131	1	San Pedro, California	Lieutenant Trowbridge .....	.....
3171	1	San Diego, California	Dr. Hammond .....	.....
3170	2	San Francisco, California	R. E. Cutts .....	.....
3166	1	Fort Humboldt	Lieutenant Beckwith	(<i>E. s. amblygrammus</i> .)
3148	1	Pitt River Valley, California	Lieutenant Williamson	Alcoholic.
9053	1	Oakland, California	K. Hemphill	do.
9229	2	El Dorado County, California	Dr. C. C. Boyle	do.
9227	30	California .....	.....	do.
9228	2	.....	.....	do.
5310	4	Cape St. Lucas, L. California	John Xantus	do.
6282	1	Clarks Fork, Lower Kootenai River	Dr. Kennerly .....	.....
6583	1	Monterey, California	Dr. Canfield .....	.....
11756	2	Fresno, California	G. Eisen .....	.....
11758	1	do	do .....	.....
11795	3	do	do .....	.....
11797	1	do	do .....	.....
11799	1	do	do .....	.....
12559	1	do	do .....	.....
13941	1	Berkeley, California	R. E. C. Stearns .....	.....
13774	1	Fort Klamath, Oregon	Capt. C. Bendire .....	.....
12558	1	Fresno, California	G. Eisen	(<i>E. s. brevipes</i> .)

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	Date.	Collector.
18598	adult.	Argus Range, Maturango Spring, California	<i>Feet.</i>	May 8	Fisher.
18599	adult.	do .....	.....	May 8	do.
18600	adoles.	Panamint Mountains, head of Willow Creek, California	7,000	May 10	Nelson.
18601	adult.	Kern River, 25 miles above Kernville, California .....	.....	July 4	Fisher.
18602	young.	Soda Springs, North Fork Kern River, California .....	.....	Aug. 15	Ballley.
18603	adult.	Old Fort Tejon, California .....	.....	July 5	Palmer.
18604	adult.	do .....	.....	July 8	do.

Catalogue No.	Number of specimens.	Locality.	From whom received.
16343		Orentt, San Diego County, California	C. R. Orentt.
16523		San Diego County, California	do.
16176-7		Salem, Oregon	O. B. Johnson.
16523		San Diego County, California	C. R. Orentt.
20211		Witch Creek, Santa Ysabel, San Diego County, California	H. W. Henshaw.
20341		do	do.
20385		do	do.
20915		Ukiah, Mendocino County, California	do.
31999		Jacumba Hot Springs, San Diego County, California	Dr. E. A. Mearns.

EUMECES GUTTULATUS Hallówell.

Eumeces guttulatus COPE, Check-list N. Amer. Rept., 1875, p. 45.—BOULENGER, Cat. Liz. Brit. Mus., III, 1887, p. 369.

Lamprosaurus guttulatus HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1852, p. 206; Sitgreaves' Exped. Zuni and Color. River, 1853, p. 103, pl. iv.

Plestiodon guttulatus HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1857, p. 215.

Plates of head generally similar to those of *P. quinquelineatus*. The frontal small, transversely lozenge-shaped, and about equal to the post-frontals. Quite acute laterally, where it touches the posterior post-nasal. This is higher than the loreal and is about twice the area of the anterior post nasal passing above it, the two of about the same length and together about as long as the loreal. The limbs are short, the hinder applied forward, reaching halfway to the ear, and contained rather more than two and one-half times in the body. The forelegs reach to the angle of the mouth and are longer than the head. The hind leg from knee is contained three and one-half times in head and body and is one and one-third times the head to ear, which again is contained four and one-half times in head and body. The first toe is rather shorter than fifth; the free portion of longest toe very little more than half the head (to ear). Scales on sides arranged very obliquely, so as to render it impossible to count the encircling series. There are, however, about twenty-eight rows, and about fifty-seven from head to tail.

The very young in this species (head and body, 37.5 mm.) is entirely black, the end of the tail becoming bluish; each plate on the side of the head above, each labial, upper and lower, and each mental plate with a conspicuous, rounded, bluish-white spot occupying all but the outer border. The effect is that of three rows of spots on the side of head and one on each side the chin. The middle lateral, or that on the upper labial, is continued backward as a large spot in front of the ear and another on its posterior edge running out behind into a point. There are traces of similar spots on the other cephalic plates, but much less distinct.

With advancing age the ground color becomes more olivaceous. paler beneath, each upper scale with a posterior margin of darker olive very well defined. These characters continue until the specimen is 75 mm. long, head and body (Cat. No. 3162), the spots on the chin only disappearing in the pale olivaceous green of the under parts. In Cat. No. 3162 the light line through the ear is continued faintly to the foreleg.

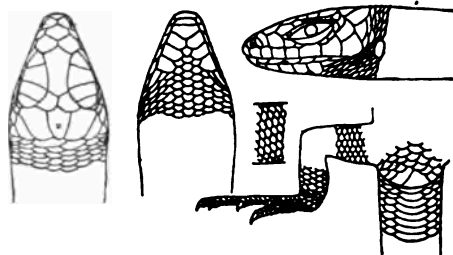


Fig. 127.

EUMECES GUTTULATUS HALLOWELL.

× 2.

Arizona.

Cat. No. 8176, U.S.N.M.

Eumeces guttulatus Hallowell.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
3179	2	Head of Cimeron.....		J. H. Clark.....	
3182	1	Matamoros, Texas.....		Lieutenant Couch.....	
3182	1	Little Colorado.....		Captain Sitgreaves.....	
3185	1	Between Guadalupe Mountains and Rio Pecos.....		General Pope.....	
3114	1	Near San Francisco.....		General Emory.....	
3115	1	Upper Arkansas.....		Lieutenant Beckwith.....	
3163	1	San Elisario, Texas.....	Aug. 1, 1855	General Emory.....	
3160	1	Western Texas.....	do	do.....	
3170	1	Arizona.....	do 1871	Expl. W. of 100th M.....	Alcoholic.
3176	2	do.....	do 1871	do.....	do.
9231	1	Gila River, Arizona.....		Dr. C. G. Newberry.....	
11598	1	Near lat. 30°.....		Capt. J. Pope.....	

To these localities my friend, Mr. T. D. A. Cockerell, has added Las Cruces on the Rio Grande, New Mexico, from which place he sent me a specimen.

EUMECES OBSOLETUS Baird and Girard.

Eumeces obsoletus COPE, Check-list N. Amer. Rept., 1875, p. 45.—BOCOURT, Miss. Sci. Mex., Rept., 1887, p. 443, pls. XXII A, fig. 4; XXII D, fig. 4.—COPE, Bull. U. S. Nat. Mus., No. 17, 1880, p. 39.—BOULENGER, Cat. Liz. Brit. Mus., III, 1887, p. 374.

Plestiodon obsoletus BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 129.—HALLOWELL, Sitgreaves' Exped. Zuni and Color. Riv., 1853, p. 111.—BAIRD, U. S. Mex. Bound. Surv., Rept., 1859, pl. xxv, figs. 9-16.

(Type, Cat. No. 3133.) The character of the cephalic plates appears to be essentially the same as in *E. quinquelineatus*. The limbs are short; the hinder applied forward reach just three times to the tip of nose. The fore legs reach forward to the angle of the mouth. The hind leg from knee is about one and one-fifth the head to ear, which is contained five times in the head and body, the hind leg from knee, four and one third times. The neck is thick; the width of head three-fourths the length. The toes are short and thick, the fifth hinder decidedly less than the second, instead of longer, as in *quinquelineatus*. The toes are all short; the free portion of longest less than half the head to ear; the fifth less than second. Claws long, acute. There are twenty-six rows of scales around the body, and fifty-nine from occiput to tail.

Adult light yellowish or reddish blue, each scale with a dusky border, greenish white beneath. Head with a reddish tinge. Young black, the tip and sides of chin white; the labials spotted with white. Five very faint whitish lines; the upper lateral on adjacent edge of scales; the lower distinct only on side of neck. Faint spots on side of neck, cephalic plates above not spotted.

This species appears to be characterized among its immediate allies by the shortness of the hind toes, the fifth hind toe conspicuously shorter than the second. The description given above is from the type (Cat. No. 3133), which is an old individual.

In a single very young specimen (Cat. No. 3113), head and body thirty-four millimeters long, I find what I consider the very young stage of this species. The distance from the centers of insertion of the fore to that of the hind leg is one and one-half times that from the former to the snout. The hind leg applied forward twice, reaches a little more than halfway from arm to ear, and is contained two and two-thirds times in the head and body. The hind leg from knee is contained three and one-half times in the head and body. The fore leg from elbow is about equal to the head. The fifth hind toe is decidedly shorter than the second, the free portion of longest toe barely exceeding half the side of head. The head is broad, depressed. The color is an intense black, rather bluish beneath. There are five excessively faint, slender, whitish lines, a median dorsal, an upper lateral on the adjacent edges of the

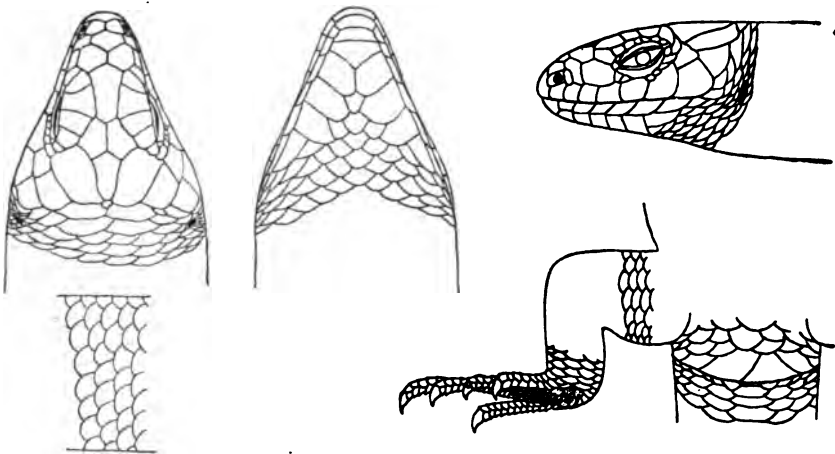


Fig. 122.

EUMECES OBSOLETUS BAIRD AND GIRARD.× $\frac{1}{2}$.

Arizona.

Cat. No. 14776, U.S.N.M.

third and fourth rows of scales. The lower lateral stripe is only appreciable on the neck. The extreme tip of the chin and sides of head beneath are whitish; the sides of the jaws are similar, but the sides of the labials are dusky. The posterior labials each have a large spot of white continued one anterior to and another behind the ear. The upper lateral stripe is continued along the side of the upper surface of the head, but the plates are not spotted.

This type of youngest coloration differs from that of *guttulatus* in the presence of fine light lines instead of a uniform black. The tip and sides of chin are entirely whitish, with an occasional dusky spot, instead of having each plate on the sides spotted sharply with white. The lower labials are more continuously whitish, and the upper are white, with the upper and lateral edges dusky, instead of having each labial

black with a central white spot. The posterior upper labials, indeed, are spotted, and there is a spot anterior to and one behind the ear, but no farther, neither are there the spots on the sides of the head above, but, instead, a faint continuous line.

I have before me no such series of specimens as of *guttulatus*, but one nearly as large as the type Cat. No. 3161 is distinctly marked with nearly black lines on a light olive ground, the upper labials distinctly spotted. There is a broad central stripe of the light olive, occupying the adjacent two-thirds of the two middle rows of scales. The upper edge of the second row, however, is olive, this color interdigitating with the black on the outside of second row. In this respect it differs from the corresponding stripe of *multivirgatus*, in which the adjacent thirds of the first and second rows are involved in a common brown stripe. The adjacent edges of the second and third rows of scales are brown. This is followed by four light and three dark stripes. The most conspicuous markings, however, are the four dark stripes on $4\frac{1}{2}$ rows of scales, the central third of the space being plain olive, the two dark stripes on each side of this being nearly equal to each other and to their olive interspace. The scales have no dusky edging behind in the light stripes. This differs from *multivirgatus* again, in having the inner dark dorsal stripe as small and even smaller than the other, instead of larger.

In Cat. No. 4140, still larger than the type, the upper dorsal dark line has disappeared, leaving the lower quite distinct (separated from its fellow by four rows of scales). All the dorsal scales are margined behind with dusky.

All the other large specimens are entirely without lines. All the scales edged behind with dusky. Cat. No. 3161, however, has none of the scales with dusky edges behind where traversed by the olive stripes.

In respect to the very largest specimens I have no means of deciding as to whether they really belong here or to *guttulatus*. I have decided the question chiefly on account of the short legs and hind toes. One of these from Matamoras, Cat. No. 3151, is the stoutest North American skink I have ever seen. The head and body together measure 5 inches; the head is 27.5 mm. wide, or equal to the distance from nostril to ear, and the circumference of the perfectly cylindrical body where thickest is 100 mm.

The postnasal plate is sometimes absent. Such is the case in Cat. Nos. 4770, 5247, and 7842. In Cat. No. 9225 it is present on one side and absent on the other. These have 28 rows of scales, except Cat. No. 7842, which has 26.

Some exceptional forms of *Eumeces obsoletus* have been sent me from Douglas County, Kansas, by Prof. F. H. Snow, of Lawrence. It is represented by three large adult individuals of very light colors. They differ remarkably in the scuta of the nose. In one the frontonasals and supranasals are in contact; in the other two they are separated by

the prefrenals. In the former there is one prefrenal on both sides, and a postnasal on one side. In No. 2 there is a postnasal on each side, and two prefrenals, one above the other, on one side only. In No. 3 the postnasal plate is elevated and is in contact above with the interfrontonasal. On one side of the head it is divided by a horizontal fissure into two scuta, one above the other; the other side is undivided. The hinder leg measures one-third the distance from its base to the end of the muzzle. When extended along the side, the fore and hinder limbs just touch the extremities of each other's claws. The second and fifth posterior toes are of equal length. Color pale ashen, with a bluish or greenish tinge. The external edges of the scales of the second row from the median line are brown, forming a longitudinal line on each side. In the same way the edges of the scales of the oblique lateral rows of scales are brown. These oblique brown lines are each six or seven scales long; anteriorly they become more longitudinal, two parallel lines running backwards from above the superior border of the ear. Superior labial plates brown-edged. Scales of posterior faces of limbs brown-edged.

Measurements.—Length to vent, 101 mm.; length to axilla, 38 mm.; length to meatus of ear, 20 mm.; length of hind leg, 32 mm.

No. 1 is colored like No. 3, omitting the dorsal lines; No. 2 is like No. 1, except that the lateral brown forms a loose band.

This species is characteristic of the Central region of the Nearctic Realm, not occurring in the Eastern, Austroriparian, or Pacific regions. It overruns a little into the borders of the Texan district and the Sonoran region. It ranges from the Platte River, Nebraska, on the north to the city of Chihuahua on the south. Mr. Marnock obtained this species near Helotes, Texas, where it is rare. I saw, but did not succeed in capturing, a lizard which I suppose to belong to this species, near the head waters of the Medina River. It was of dark tints, with light spots on the sides of the head, like the younger stages described by Professor Baird. It was concealed beneath the bark of a log, and, evading for a considerable time my attempts to take it, finally escaped.

Eumeces obsoletus Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3133	1	San Pedro, Texas	Colonel Graham	Alcoholic.
3161	1	Llano Estacado, Texas	Captain Pope	do.
4140	1	Platte River, Nebraska	Dr. Hammond	do.
3157	1	Santa Caterina, Nuevo Leon	Lieutenant Couch	do.
3151	1	Matamoras, Mexico	do	do.
3113	1	Coal Creek	Lieutenant Whipple	do.
3117	2	El Paso, Texas	J. H. Clark	do.
9048	2	do	do	do.
7842	1	Fort Reynolds	A. Clough	do.
9222	1	Matamoras, Mexico	do	do.
5049	1	Fort Riley, Kansas	H. Brandt	do.
4770	1	do	do	do.
9224	1	Santa Caterina, Nuevo Leon	Lieutenant Couch, U.S.A.	do.
9225	1	Platte River	Dr. William A. Hammond, U.S.A.	do.
8180	1	Utah	Dr. H. C. Yarrow	do.
9220	1	Tamaulipas	Lieutenant Couch, U.S.A.	do.
9238	1	Mexican boundary, Texas survey.	Dr. C. B. Kennerly	do.
5247	1	Texas	J. H. Clark	do.
9226	1	do	do	do.
9221	1	do	do	do.
14776	1	Ash Creek, Arizona	W. L. Carpenter	do.
15615	1	Arizona	Dr. E. Coues	do.
15649	1	San Diego, Texas	W. Taylor	do.
15662	1	Tucson, Arizona	H. Brown	do.
17068	1	Cameron County, Texas	C. K. Worthen	do.
15714	1	Prescott, Arizona	Captain W. L. Carpenter	do.
22271	1	Las Cruces, New Mexico	T. D. A. Cockerell	do.

EUMECES EPIPLEUROTUS Cope.

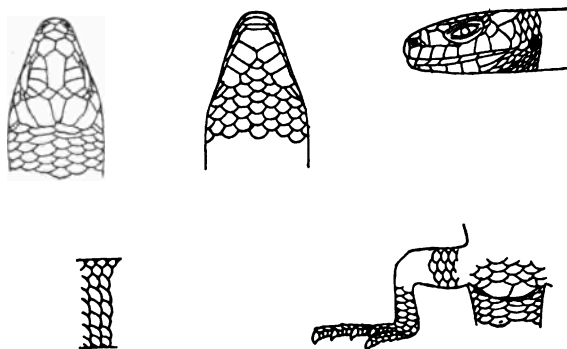
Eumeces epipleurotus COPE, Bull. U. S. Nat. Mus., No. 17, 1870, p. 40.

Fig. 129.

EUMECES EPIPLEUROTUS COPE.

× ½.

Texas.

Cat. No. 5263, U.S.N.M.

The species belongs to the group of the *E. quinquelineatus*, having a small postnasal in front of the base of the preloreal, and has but twenty-four rows of scales. The preloreal reaches the transverse interfrontonasal, which is smaller than each prefrontal. The limbs are not very short, being separated when applied to the side by a space less than the length of the forefoot. The coloration is as follows: The median dorsal pale band covers only the adjacent halves of the two median rows of

scales. A black band bordering it occupies the remaining half of the row with the adjacent half of the next row. The remaining half of the next row is occupied by a pale band. A black line passes along the adjacent edge of the next row, whose middle is white. The external edge of the same row is involved in the superior edge of a wide band, which covers two rows and two half rows. Thus there are three dark bands on each side of the middle line, the inferior being the widest. Altogether they cover only five and a half rows of scales on each side. There are also no lateral light bands, as in many species, but the color of the abdomen extends to the lower dark band. Size rather small; length of head and body, 70 mm.

This species is allied to the *E. leptogrammus* Baird. Most of the specimens of that species have twenty-six rows of scales, but one of them has twenty-four. In all the specimens of the latter the internasal is relatively larger, equaling, or nearly equaling, a prefrontal; in *E. epipleurotus* it is about half as large as a prefrontal. The rostral plate in *E. epipleurotus* is more elevated and acuminate above, its lateral labial border being about one-third the remainder, while in *E. leptogrammus* it is more than half the length of the same. The anterior ventral is smaller. The appressed limbs of the *E. leptogrammus* touch each other. It is possible, but very uncertain, that Boulenger is right in supposing *E. epipleurotus* to be the adult of *E. leptogrammus*.

I find but one specimen at present in the U. S. National Museum which is the original type.

Eumeces epipleurotus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
5263	1	Northern boundary of Texas	J. H. Clark.....	Alcoholic; type.

EUMECES LEPTOGRAMMUS Baird.

Eumeces leptogrammus COPE, Check-list N. Amer. Batr. and Rept., 1875, p. 45.—BOULENGER, Cat. Liz. Brit. Mus., III, 1887, p. 378.

Plestiodon leptogrammus BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 256.

Head short, rather broad, and with the lateral profile sloping considerably or quite convex. Cephalic plates much as in *quinquelineatus*, though the posterior postnasal sometimes entirely above the first, or divided in two. Seven upper labials. Limbs short and weak. Hind leg laid forward twice reaches midway between arm and ear, and from foot is about one-third the head and body; from knee is contained nearly four times. Fore leg from elbow is not equal to head from snout to ear, which again is contained four and one-half times in head and body. Tail one and one-fourth times the head and body; cylindrical. In one specimen twenty-four rows of scales around the body; the median scarcely wider, and fifty-eight from head to tail; fifth hind toe shorter than second, free portion two-fifths the size of head to ear.

General color black, olivaceous above, with five very narrow and inconspicuous greenish-white dotted stripes; one dorsal (widest) and two lateral on each side. Tail and body beneath dark blue. Chin, throat, and upper labials white. The upper lateral stripe along the middle of the third row of scales from the median line; the lower on the middle of the third from this. Scarcely a trace of the bifurcation of the middle dorsal stripe; the hind legs uniform black.

The dorsal stripe is on the adjacent edges of two rows of scales. The others each on the middle of one series, thus differing from *P. quinquelineatus*, in which they are on adjacent edges. The lateral stripes are not continuous lines, but only a succession of dots, one central on each scale. The median stripe is similarly constituted by dots on the adjacent edges of two rows of scales, and is usually less distinct than the lateral. There is a faint indication that the remainder

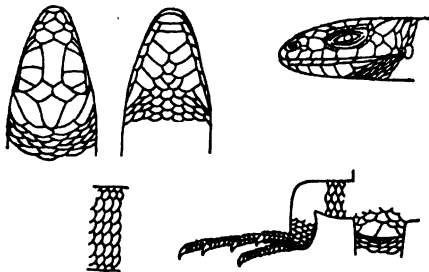


Fig. 130.

EUMECES LEPTOGRAMMUS BAIRD.× $\frac{1}{2}$.

Wyoming.

Cat. No. 2180, U.S.N.M.

of the white dotted scales is black, leaving a dark olivaceous row on each side the back, each scale in which sometimes has a lighter center. There can scarcely be said to be a bifurcation anteriorly of the median stripe. There are four entire rows of scales on the back between the upper lateral stripes.

This species, remarkable for its diminutive size, has the general appearance of a very young *P. quinquelineatus*, but differs in being darker, in having the light

lines very narrow and inconspicuous, not continuous, but formed by a succession of whitish dots, the lateral on the centers of single rows of scales instead of on their adjacent edges. The hind legs are entirely black without a trace of the posterior white line. The cephalic bifurcation is wanting. The head is shorter, higher, and more arched. The dorsal is shorter. There are seven labials instead of eight. The legs are much weaker and smaller, the hinder contained three times instead of two and one-half or less in the head and body. The scales are fewer in number. The hinder postnasal is very apt to be the first above to accommodate the brevity of the muzzle.

This is also a species of the Central region.

Eumeces leptogrammus Baird.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.
3119	10	Running Water, Nebraska.....		Lieut. Warren.
3112	2	Bluffs Pole Creek.....	July 25, 1856	Lieut. Bryan.
3117	2	Cheyenne Pass.....		do.
3180	12	100 miles east of Laramie.....		Dr. Cooper.

EUMECES MULTIVIRGATUS Hallowell.

Eumeces multivirgatus COPE, Check-list N. Amer. Batr. and Rept., 1875, p. 45.

Plestiodon multivirgatum HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1857, p. 251.

Plestiodon inornatus BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 256.

Eumeces inornatus COPE, Check-list N. Amer. Batr. and Rept., 1875, p. 45.

Body cylindrical; slender; legs far apart. Head short; convex above; two postnasals, usually of equal size, one exactly above the other. Very rarely one higher behind the other or divided into two. Seven upper labials. Ear very small, circular. Hind legs applied forward twice fall behind the fore leg, and three times reaches to the angle of the mouth, and is contained three and one-third times in head and body; from knee contained four and a half times. Fore leg from elbow as long or rather longer than from snout to ear, which is contained five and a half or six times in the head and body. Tail one and a half times the head and body. Fifth hind toe shorter than second; free portion of longest toe more than half the head—about three-fifths. There are twenty-four to twenty-six rows of scales round body, and about sixty-three above in line from head to tail. The lateral rows are quite longitudinal and parallel to the dorsal.

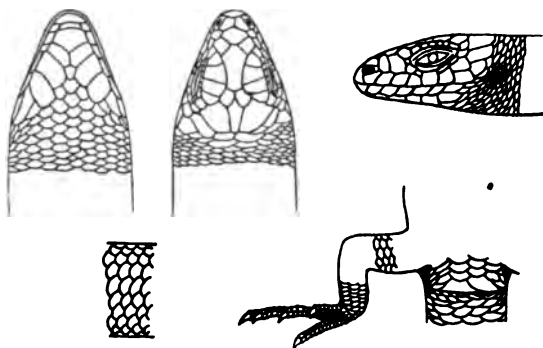


Fig. 131.

EUMECES MULTIVIRGATUS HALLOWELL.

× $\frac{1}{2}$.

Nebraska.

Cat. No. 4129, U.S.N.M.

Color pale olive, green, or gray, lighter beneath and on the

sides, with four or five brown stripes on each side. Every row of scales striped with brown and the ground color. There is a narrow whitish stripe through the middle of the third row of scales from the dorsal line; the sides of the scales brown; above this line are two brown stripes, the inner wider; below it are three others, the middle broadest and along the edge of the head. The scales on the tail and legs are edged with brown; chin paler than the belly; the labials whitish, without brown, except on the upper edge.

As already stated, the back is much varied with lines of very light olive, greenish, or greenish ash, and brown. The key to the coloration is to be sought in a narrow line, lighter than the rest and sometimes almost white, which begins on the edge of the upper surface of the head and extends backward along the central third of the third row of scales from the median line of the back. The two sides of this row

being brown gives rise to two of the narrow brown lines. The adjacent or inner half of the two median dorsal rows are plain and of the ground color; their exterior halves and the adjacent third of the next row are brown, producing the broad dorsal stripe. The second row of scales is thus left olivaceous along the central third, and brown externally, much as in the third row. The inner or upper half of the fourth row is light olive, interdigitating into the brown of the third row; its lower half, with the upper third of the next or fifth row, forms the second broad brown stripe. The central and lower third of this fifth row is light, the upper third brown. The next, or sixth, row when colored has a light line along the center, the sides brown, the lower brown, sometimes the upper wanting.

This species is very similar to that described as *P. leptogrammus*, but has a shorter head, much more elongated body, and feebler limbs; almost always two postorbitals, one above the other, not behind it. The theory of coloration is much the same, it being only necessary to have *leptogrammus* become light olive in the ground color, and the indications of dark stripes to become more distinct by the contrast. Indeed, but for the total difference in proportions, as substantiated by the comparison of a large number of specimens of each, I would have no hesitation in combining them.

A color variety which is unstriped was regarded by Baird as a distinct species under the name of *Plestiodon inornatus*. A specimen displays the following general characters:

Body cylindrical, slender. Legs far apart. Head short, conical, convex above, as high as broad; two small postnasals, about equal, one exactly above the other. Hind leg applied forward twice reaches four-fifths of the way to the fore leg; three lengths reach to the ear; it is contained three and one-half times in the head and body; from the knee nearly five times. Fore leg from elbow as long as from snout to ear, which is contained five and one-half times in head and body. Tail one and one-half times head and body, constricted at base, then swelling. Fifth hind toe shorter than second; free portion of longest barely exceeding half the head to ears; about twenty-four rows of scales round the body; the lateral parallel to the dorsal; about fifty-eight scales from head to tail.

Color, very light olive, tinged beneath with bluish; without any dusky marks whatever; whiter beneath the head.

Eumeces multivirgatus Hallowell.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
3183	1	Pole Creek, Nebraska.....		Capt. Bryan.....	
3142	1	Running Water River.....		Gen. Warren.....	
3158	8	Bluffs Pole Creek.....	July 25, 1856	Capt. Bryan.....	
9219	1	Fort Kearney, Kansas.....		!	
9264	1	100 miles east of Fort Laramie.....		Dr. Cooper.....	
3122	1	Rio Pecos, Texas.....		Capt. J. Pope.....	Types of <i>P. inornatus</i> .
4139	10	Sand Hills, Platte River, Nebraska.....		Dr. F. V. Hayden.....	

This species is characteristic of the Central zoological district.

EUMECES EGREGIUS Baird.

Eumeces egregius COPE, Check-list N. Amer. Batr. and Rept., 1875, p. 45.

Plestiodon egregius BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 256.

P. onocrepis COPE, 2d and 3d Ann. Report Peabody Acad. Sci., 1871, p. 82.

Eumeces onocrepis COPE, Check-list N. Amer. Batr. and Rept., 1875, p. 45.

Body slender, cylindrical, vermiform, flattened a little above. Ears excessively minute. Legs very small. The preloreal in contact above with the transversely elongated internasal. Three supraorbitals or four, including the one

in contact with the loreal. Hinder edge of postnasal a little anterior to that of second labial. Two transverse plates at end of chin. Seven upper labials. Lower eyelid plated. Scales in twenty-two rows round body and sixty-five from head to tail; the two median dor-

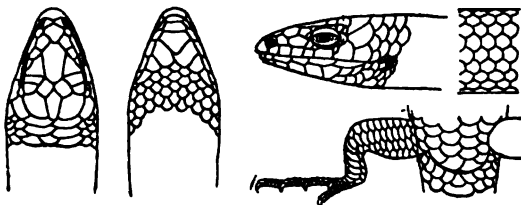


Fig. 132.

EUMECES EGREGIUS BAIRD.

× 2.

Florida.

Cat. No. 19961, U.S.N.M.

sals considerably broader than the rest. Distance from snout to middle of insertion of fore leg one-third that to hind leg. Hind legs applied forward thrice reach to ear; contained nearly four times in head and body; from knee, four and one-half times; head, five times. Fifth hind toe shorter than second; free portion of longest two-thirds the side of the head.

Above reddish or greenish, olivaceous or ashy, with four principal nearly equidistant white stripes, two on each side, on the centers of rows of scales, and margined with dotted lines of dusky. A third intermediate line traceable anteriorly. Upper lateral stripes separated by two plain rows of scales; sides between the stripes with the scales edged behind with dusky. The lower lateral stripe begins on the labial and passes above the ears; beneath, white with a tinge of salmon color.

This species is very small and delicate, the limbs weak, although the toes are very long. The head is conical, pointed. The ears are very minute, not larger than the puncture of a fine pin.

The rows of scales traversed centrally by the light stripes have the edges dusky. The upper stripe passes through the center of the second row, the long lower one through that of sixth. The intermediate line, not always appreciable, and confined to the anterior half of body, traverses the center of the fourth row. The lateral scales between these stripes are dusky behind; those on the back are plain. The lower edge of the posterior upper labials is spotted with dusky; the white stripe on the labials very distinct from the snout and suffused above with blackish. The anteorbitals and postorbitals are each white and black. There are no distinct lines on the legs. The young are probably entirely black between the lateral stripes. The tail has dusky lines on the sides, but no white ones, nor is there blue anywhere.

This species is more slender and elongated than any of its allies with a single nasal, and is easily distinguished by color and the separation of the upper lateral stripes by two rows of scales. The fusion of the third and fourth large supraorbital plates, counting from behind, is a striking peculiarity. The dorsal intervals of the stripes is seemingly greater than the lateral.

Eumeces egregius Baird.

Catalogue No.	Number of specimens.	Locality.	From whom received.
4142	1	Key West, Florida.....	W. Thomas.
3127	2	Indian Key, Florida.....	G. Wurdeman.
12002	3	Georgiana, Florida.....	W. Wittfield.
19980	1	Eustis, Florida.....	S. R. Sloan.
19981	1	do.....	Do.

EUMECES SEPTENTRIONALIS Baird.

Eumeces septentrionalis COPE, Check-list N. Amer. Batr. and Rept., 1875, p. 44.

Plestiodon septentrionalis BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 256; Rept.

U. S. Expl. Surv. Pac. R. R., Pt. 4, X, 1859, p. 18, pl. xxiv, fig. 2.

Body and neck cylindrical, stout; head small, conical, and depressed. Interfrontonasal plate small, rhomboidal, embraced between the supranasals and prefrontals, which are broadly in contact. A single postnasal (about equal to the nasal), equal in height and half the length of the loreal. Seven upper labials, two mentals, limbs short, the hinder reaching forward less than halfway to the fore legs and contained three and one half to four times in head and body. From nose to center of insertion of fore leg is half way from this to hinder leg (in one specimen to anus). Head (to ear) contained between five to six times in head and body. Fifth hind toe a little shorter than second; the free portion of longest toe equal half the side of head. There are twenty-eight rows of scales around the body, the lateral quite parallel with the dorsal and fifty-nine scales from head to tail. Tail one and three-fourths times the body.

General color above light olive green with two lateral white stripes

inclosing a black one, the upper on each side along the center of one row of scales and separated by six dorsal rows. Four equal and equidistant black dorsal stripes between the white ones, each on two adjacent half rows of scales, the exterior margining the white lines, the inner obsolete in old specimens. Beneath greenish white, more yellowish under the chin, lower white line passing above the ear. Upper labials white. A faint whitish line below the thigh, margined above and below with dusky.

The frontal is sometimes very small or even wanting, and always (with rare exceptions) cut off from contact with the postnasal. In one specimen it is applied against the frontal. In the most typical speci-

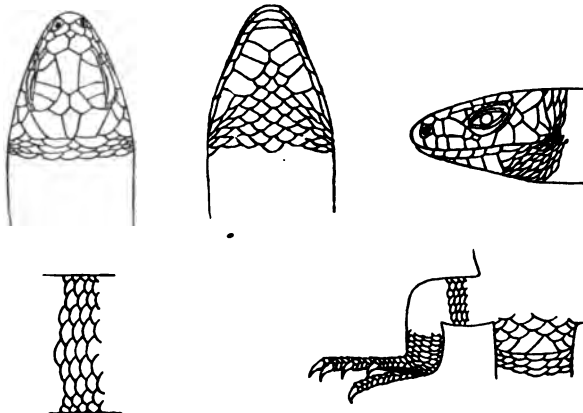


Fig. 133.

EUMECES SEPTENTRIONALIS BAIRD.

× $\frac{1}{2}$.

KANSAS.

Cat. No. 4722, U.S.N.M.

mens the frontal, the postfrontal, and internasals are all rhomboidal, the latter rather smaller and transversely; the rest about equal, their longer axis longitudinal.

In the smallest specimen of Cat. No. 3156 the hind legs reach forward half way to the center of insertion of fore leg, the third application falling a little short of the nose. In the other two, however, three applications of this length reaches only to the ear. The small specimen has longer limbs than the largest, in which the hind foot from heel is contained five times in head and body. The white lateral lines are very well defined and narrow, the upper beginning on the superciliary edge, the lower beneath the eye on the upper edge of the fifth labial and passing upwards so as to proceed backwards along the upper edge of the ear and not through it, as in most species. Posteriorly, it usually passes along the center of the second row below that traversed by the upper line, the black interval being then 1 and $\frac{2}{3}$ scales wide. Frequently these intervening black scales are olivaceous at their bases, so

as to produce the effect of a succession of narrow light crescents, the concavity posterior. The lower white line is usually margined narrowly below by blackish.

It is probable that in the very young the adjacent edges of the two central and the third and fourth lateral upper rows of scales form whitish lines alternating with the dusky ones. They, however, fade out. The two central dusky stripes are not pure black as is that margining the upper lateral stripe above, and soon fade, but there is generally a trace left along the adjacent edges of the first and second rows in each side. The scales below the lateral stripes have rather paler edges. The lateral stripes extend some distance on the tail.

A comparison is scarcely needed between this species and the *E. quinquelineatus*, one having a postnasal, the other none, with other differences in the head and many in general proportions. The upper lateral stripe is on the middle of one row, not on adjacent edges of two; the lateral stripes are closer together; the lower passing above the ear instead of through it.

This is another species of the plains of the Central region, and it ranges farther north than any species of the genus, that is, to the northern part of Minnesota.

Cat. No. 11840 from Old Fort Cobb presents a remarkable exception to the normal character, in having the frontonasal extended laterally so as to reach the loreal on both sides. This specimen is otherwise normal. In Cat. No. 15685 the internasal is similarly extended to the loreal, but the contact on one side is very slight. The color is peculiar, being olivaceous, with a brown band on each side which covers one and two half rows of scales, and has a pale border above throughout as far forward as the supraorbital plates. It is pale bordered below from the auricular meatus to near the middle of the side.

A large adult (Cat. No. 11699) is uniform dark brown above, and yellowish brown below.

The two specimens, Cat. No. 5325, differ from the types in the relatively longer legs. They are, when extended on the side, only separated by a space equal to the length of the forefoot. In the typical form the space is equal to the length of the forearm and forefoot together.

Eumeces septentrionalis Baird.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3156	3	Fort Ripley, Minnesota.....	Governor Stevens	Alcoholic.
3145	2	Red River of the North	R. Kennicott	
3137	1	Sand Hills, Nebraska.....	General Warren	
5325	2	(f) .....	.....	
4722	1	Neosho Falls, Kansas	B. F. Goss	
9219	1	Fort Kearney, Nebraska.....	(f)	
11699	1	(f)	(f)	
11840	.....	Old Fort Cobb	E. Palmer	
15685	.....	(f)	(f)	

EUMECES PACHYURUS Cope.

Eumeces pachyurus COPE, Bull. U. S. Nat. Mus., No. 17, 1880, pp. 19, 39.—BOULANGER, Cat. Liz. Brit. Mus., III, 1885, p. 377.

Tail long and thick at the base. No postnasal plate; anterior loreal elevated, reaching the transverse interfrontonasal plate. Postloreal as high as or higher than long; two preoculars between fourth and fifth superior labials; one mental; twenty-six rows of scales; tail large, nearly as stout as the body at the base, subtetragonal; legs small, separated by the length of the anterior limb when appressed; the hind leg a little more than one-fourth the length of the head and body. Above, light brown; below, pale greenish; anteriorly, straw-colored; a light narrow band from the superciliary border continued along the body and tail, separated from that of the opposite side by six scales, and with a strong black border above. Below it, a deep brown or black band one and two half scales wide, which is bounded below by another light line; this is in turn bordered by a narrow brown line below, which does not extend like the other bands on the tail. The head and lips are pale brown, and the only head bands are posterior to the orbits.

Measurements.—Length of head and body, 78 mm.; to ear from muzzle, 13 mm.; of fore limb, 15 mm.; of hind limb, 19 mm.

This elegant species belongs to the same group as the *E. brevilineatus*, and differs from the *E. anthracinus* and *E. tetragrammus* in the same characters. It differs from the *E. brevilineatus* in the higher loreal plates, the much smaller limbs, and totally in the coloration. One specimen only is in my collection; it was procured near Dallas by Mr. Boll. In size, it is above the average in the genus.

I find on comparison of this species with specimens of *E. septentrionalis* Baird from Neosho Falls, Kansas, in the National Museum, that the differences between the two species are not great, but that they are nevertheless sufficiently distinguished by the following characters:

E. pachyurus.

Postnasal scute reaching interfronto-nasal.
No dark dorsal stripes.
Rows of scales, 26.

E. septentrionalis.

Postnasal widely separated from interfrontonasal.
Two black dorsal stripes.
Rows of scales, 28.

Unfortunately I have temporarily mislaid the only specimen of this very distinct species which I have seen, and can not therefore give a figure of it.

EUMECES TETRAGRAMMUS Baird.

Eumeces tetragrammus COPE, Check-list N. Amer. Batr. and Rept., 1875, p. 45.—

BOULENGER, Cat. Liz. Brit. Mus., III, 1887, p. 375.

Plestiodon tetragrammus BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 256; U. S. Mex. Bound. Surv., Rept., 1859, p. 12.

Eumeces obtusirostris BOCOURT, Miss. Sci. Mex., Rept., 1881, p. 441, pl. xxii D, fig. 1.

Form and appearance of *P. anthracinus*. Dorsal rows of scales, twenty-six to twenty-eight; 57 from head to tail; cephalic plates much as in *P. anthracinus*, but the single postnasal exactly above the sec-

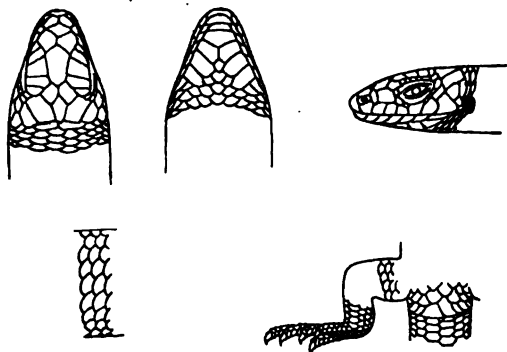


Fig. 134.

EUMECES TETRAGRAMMUS BAIRD.

× $\frac{1}{2}$.

TEXAS.

Cat. No. 15543, U.S.N.M.

ond labial, their posterior edges in line, the two small anteorbitals wedged between the fourth and fifth upper labials, instead of third and fourth; the frontal hexagonal, much wider than long instead of rather longer than wide; anterior single plate of chin generally divided into two instead of single.

General color of body and limbs clear dark olive above, with two yellowish stripes on each side, the two upper on the central line of the fourth row of

scales (separated by six plain rows), the lower on the middle of the seventh row; the sides between the stripes dusky, beneath lighter olive, becoming yellowish white on the chin and upper labials, which are without dusky margins

Entirely black, with an olivaceous tinge.

The species varies much in proportions, the younger having the legs longer and body shorter. Then the hind leg is contained from two and three-fourths to three and one-half in head and body; the head to ear from four and one-half to five and one-half times. The center of insertion of fore leg is from three-eighths to three-ninths the distance from snout to insertion of hind leg.

This species bears a close relationship to the *E. anthracinus*, from which it is chiefly to be distinguished, in addition to the points already stated, by the fact that the upper lateral light stripe is through the middle of the fourth row of scales instead of the third, and thus separated by six rows of scales, not four, and has no dusky edging above. The stripes are yellow, not greenish white. The sides and legs scarcely darker than the back in the young and of much the same color

in the adult, instead of being at first coal black and then olive brown. The under parts are always olive green instead of blue black or bluish in the young, changing to greenish in the older ones. The color of the back is rather a reddish than greenish olive in many specimens. The scales are much smaller, there being generally 28 round the body instead of 24. The lateral scales have generally a darker border in old specimens. Sometimes there is a dusky olive spot at the base of each dorsal scale. The upper labials are almost entirely whitish, like the chin. In the collection are ten specimens from Matamoras which agree precisely in every respect with the others, except that the body appears more cylindrical and rigid. The color, however, almost uniform lustrous black above. This color shaded, especially below and on the tail, with very dark olive. I can scarcely believe it to be a distinct species, however, and prefer to consider it as a black variety. The largest is fully equal in size to any of the striped specimens, the head and body measuring 92 mm.

This skink is so far known only from Texas.

Eumeces tetragrammus Baird.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
3138	1	Below Salado River.....	Major Emory.....	Var. <i>funebrosus</i> .
3124	12+	Matamoras, Mexico.....	Lieutenant Couch.....	
3120	2	do.....	do.....	
9233	1	do.....	do.....	
15543	1	Cook County, Texas.....	G. H. Ragsdale.....	
17084	1	Cameron County, Texas....	C. K. Worthen.....	

EUMECES ANTHRACINUS Baird.

Eumeces anthracinus COPE, Check-list N. Amer. Batr. and Rept., 1895, p. 45.—

BOULENGER, Cat. Liz. Brit. Mus., III, 1887, p. 376.

Plestiodon anthracinus BAIRD, Journ. Acad. Nat. Sci. Phila. (2), I, 1850, p. 294.

Body and head depressed, quadrangular; in section, rather slender; tail cylindrical, attenuated, one and one-half times the head and body. Supranasals, internasal, and prefrontal rhomboid; the former smaller and more transverse than the rest. One prefrontal equal to the supranasal, half as long as and higher than the pentagonal loreal, extending upward to contact with the internasal. Upper labials, six or seven. One large transverse pentagonal mental plate in the end of the chin, behind the extreme tip, instead of the two of *E. quinquelineatus*. Hind leg applied twice forward reaching about to middle of neck; contained thrice in total length of head and body; hind leg from knee about four times, head alone nearly five times. Fore leg from elbow equal to side of head. Fifth hind toe shorter than second; free portion of longest little more than half the side of head. Scales of body in twenty-four longitudinal series, quite parallel on the sides; forty-seven scales from head to tail.

Above rather dark olive green, with two well-defined white lines on

each side; their interval and a border above and below grayish black. Upper lateral stripe generally on the middle, sometimes a little below, of the third row of scales from the back; the lower on the adjacent edges of the sixth and seventh. This passes anteriorly through the ear along the upper labials. The portion of the third row of scales on the back interior to the white stripe (which occasionally is on the edge of the third and fourth) is black, leaving four dorsal rows perfectly uniform dark olive green, without least trace of a median line. Under parts light greenish, paler beneath the head; the tail bluish black. Legs black above, the under parts without trace of stripe.

The five type specimens of this species from Carlisle vary very little in coloration, except in the portion of the upper lateral stripe, which is usually on the center of the third row of scales, but occasionally near its lower edge, where, however, it only involves the very extreme edge

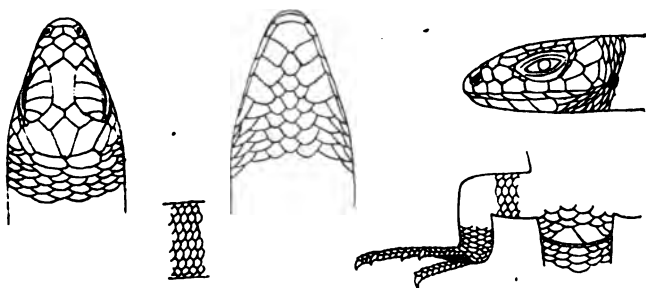


Fig. 135.

EUMECES ANTHRACINUS BAIRD.

× 2.

Pennsylvania.

Cat. No. 3128, U.S.N.M.

of the next row. It is very seldom on the fourth row. The black upper border seldom involves the outer edge of the second row, though interdigitating with it. The two upper stripes are one and one-half times wider apart than either is from its fellow below. The labials are sometimes dusky below, where traversed by the lower lateral stripe; sometimes uniform white; always dusky above. The upper stripe runs along the edge of the head above to near the nostril.

Very young specimens are lustrous black on the sides and exterior surface of hind legs; the belly, greenish blue; the tail, bluish beneath. With age the sides become more gray, the under parts lighter greenish, but there is no great difference.

This species differs from *E. quinquelineatus* in the head plates and proportions, as also in the absence of the slightest trace of a median dorsal light stripe or any bands between the two upper lateral ones. *E. skiltonianus* is more like it in markings, but has two mental plates across the chin, etc., as in *quinquelineatus*. *E. anthracinus* also has the light lines narrower, the two upper much farther apart and separated on the back by four rows of plain olive scales instead of two.

The black upper border to the upper lateral stripe is sometimes a dotted line instead of being continuous.

In a single specimen (Cat. No. 3123) there is the faintest possible trace of a light dorsal line, with remains of a dusky lateral edging in the form of fine blackish dots. This marking, however, is very obscure.

The occurrence of six rows of olive-colored scales between the dorsal stripes will not necessarily determine a specimen to be *E. tetragrammus*, this being more the result of the multiplication of dorsal scales. To ascertain the species reference must then be had to the amount of dusky color on the sides and above the upper stripe, or whether the latter is like the rest of the back, whether the mental plate is single or double, the postnasal with its hipder edge above the middle of the second labial or in line with its edge.

This species belongs to the Eastern region, being most abundant in the Allegheny district, from Pennsylvania southward. It also occurs in Texas.

Eumeces anthracinus Baird.

Catalogue No.	Number of specimens.	Locality.	From whom received.
3138	5	Carlisle, Pennsylvania.....	S. F. Baird.
3118	1	Arkansas River	S. W. Woodhouse.
3121	2	Brazos River, Texas	B. F. Shumard.
3136	1	Fort Towson, Red River, Arkansas..	Edwards.
3123	1	Laclede County, Missouri	J. H. Clark.
7037	1	.....	?

EUMECES PLUVIALIS Cope.

Eumeces pluvialis COPE, Bull. U. S. Nat. Mus. No. 17, 1880, p. 19.—BOULENGER, Cat. Liz. Brit. Mus., III, 1887, p. 376.

Eumeces anthracinus BAIRD var. COPE, Proc. Amer. Phil. Soc., 1877, p. 63.

This is a *Eumeces* of the group of the *E. anthracinus*. It has therefore four supraorbital plates and no postuasal. Its loreals are like those of that species and *E. pachyurus*, of a rather elevated form, the prenasal reaching the transverse interfrontonasal. The two preoculars are wedged between the fourth and fifth superior labials, of which the fifth is elongate and beneath the orbit. The scales are in twenty-six rows and the limbs well developed; when laid along the side they overlap, the fore claws reaching the end of the second toe. Mental undivided. Color above, blackish olive; below, malachite green. Two narrow green lateral bands separated from each other by a black band two and a half scales wide, the

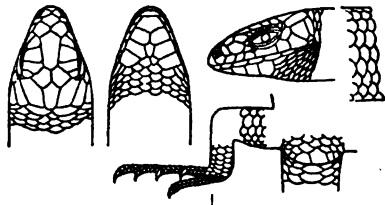


Fig. 136.

EUMECES PLUVIALIS COPE.

× 4.

Alabama.

Collection of E. D. Cope.

olive; below, malachite green. Two narrow green lateral bands separated from each other by a black band two and a half scales wide, the

upper ones of opposite sides separated by a width of six scales. There is a faint trace in the typical specimen of a pale vertebral line with a dark border on each side, and there is a black border above the upper lateral line and another below the inferior lateral line. These lines extend to the orbit and ear respectively. The superior labials are green, black bordered; the other head plates brown with black borders.

The elevated form of the loreals and undivided mental plate ally this species to the *E. anthracinus*. The more numerous scales and labial plates, the wide interfrontonasal and different coloration distinguish it. From *E. pachyurus* its well-developed limbs separate it. In *E. brevilineatus* the loreal plates are differently formed and the coloration is totally different. The size is rather small. But one specimen of this species is known. It was taken near Mobile, Alabama, by Dr. Joseph Corson, U. S. A., well known by his important additions to Eocene vertebrate paleontology. It is preserved in my private collection.

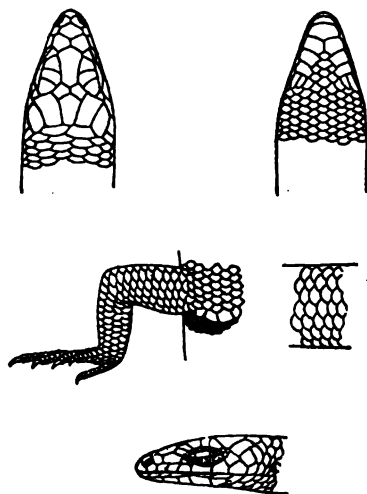


Fig. 187.

EUMECES BREVILINEATUS COPE.

× 4.

Southwestern Texas.

Collection of E. D. Cope.

EUMECES BREVILINEATUS Cope.

Eumeces brevilineatus COPE, Bull. U. S. Nat. Mus., No. 17, 1880, p. 18.—BOULENGER, Cat. Liz. Brit. Mus., III, 1887, p. 376.

No postnasal plate; anterior loreal not elevated, reaching interfrontonasal, its posterior border striking the middle of the second labial; second loreal longer than high; two preoculars between fourth and fifth superior labials. One large pentagonal mental.

Scales in twenty-six longitudinal rows. Hind leg two and one-half times in length of head and body, and meeting the fore limbs when both are appressed on the side.

Color plumbeous above, light olive below. A light band extends along the upper lip to a short distance behind the axilla, and another from the end of the muzzle over the eye to the corresponding point on the side, separated by two longitudinal rows of scales.

Measurements.—The total length is 170 mm.; from muzzle to vent, 59 mm.; length from muzzle to ear, 12 mm.

This plainly colored skink is intermediate in characters between the *E. anthracinus* and the *E. tetragrammus* of Professor Baird. It has the single mental plate of those species, but the prefrontal is not high; There are twenty-six rows of scales, and there are no lateral bands on

the body. The superior pair of pale lines are not dark-edged above, and are separated by six rows of scales as in *E. tetragrammus*. The *E. brevilineatus* was discovered by Mr. G. W. Marnock near Helotes Creek, on the front line of hills, 20 miles northwest of San Antonio, Texas, and was afterwards obtained by Mr. Boll from near Fort Concho, in the same State.

Eumeces brevilineatus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
10159	2	Helotes, Texas.....	G. W. Marnock	Alcoholic.
10527	2	do.....	do.....	do.
12777	1	Fort Concho, Texas.....	E. D. Cope	do.
13628	1	Helotes, Texas.....	G. W. Marnock	do.

ANELYTROPIDÆ.

Anelytropidæ COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 228.—BOULENGER, Ann. and Mag. Nat. Hist. (5), XIV, 1884, p. 120; Cat. Liz. Brit. Mus., 2d ed., III, 1887, p. 430.

Gymnophthalmi WIEGMANN, part, Herp. Mex., 1834, p. 11.

Scincoidiens typhlophthalmes DUMÉRIE and BIBRON, part, Erp. Gén., V, 1839, pp. 525, 832.

Typhlinidæ GRAY, part, Cat. Liz., 1845, p. 128.

The following are the skeletal characters of this family:

Premaxillary single. Epipterygoid present. Angular and surangular bones confluent. Supratemporal in contact with parietal, closing the supratemporal foramen. Meckelian groove open.

Tongue covered with imbricate papillæ. Teeth few, conical, slightly hooked. Interorbital septum well developed; no bony postorbital arch; infraorbital fossa present, bounded by the palatine and transverse bones; palatines and pterygoids not meeting on the median line of the palate. Limbs absent; pectoral and pelvic arches reduced to a small, slender bone on each side. Abdominal ribs present.

Body vermiform, with osteodermal plates, as in the Scincidæ. Eyes concealed under the skin. No ear opening. No preanal pores.

The few members of this family, a degraded type of the Scincidæ, with which they are closely connected through the genus *Acontias*, are burrowers, and were at one time believed to be confined to tropical and south Africa, but a genus which I added from Mexico shows that the Scincoid lizards have undergone in the New World the same degenerative process as in the Old World.

SYNOPSIS OF THE GENERA.

- I. Longitudinal series of scales in odd number; several small scales border the anal cleft.
 - Nostril pierced between the rostral, a nasal, and the first labial... *Anelytropis* Cope.
 - Nostril pierced in the rostral only..... *Feylinia* Gray.
- II. Longitudinal series of scales in even number; a large preanal scale; rostral covering the snout..... *Typhlosaurus* Wiegmann.

In *Feylinia* there is a long squamosal articulated to the side of the parietal, as in *Rhineura* and *Cephalopeltis*; the premaxillary is single, and the palatine laminae of the maxillary are dilated. The splenio-mental groove is open. There are two slender clavicles united medially and giving insertion to the thoracic hæmapophyses. These, according to Rathke, are present, but not in contact in *Acontias*, and Peters and Staunius failed to find them in *Typhloscincus*. The pelvis I find to be represented by an oblique bone at the extremities of two pairs of ribs on each side of the vent.

Two of the three genera of this family display the following degradational characters of the arches and limbs.

Anelytropsis papillosus Cope, from Eastern Mexico. Not previously examined.

No scapular arch; pelvic arch rudimental; no external limbs.

Pelvic arch.—This is represented by two elements, a proximal and a distal. The former is directed downward and forward. Its proximal extremity is articulated with a single simple diapophysis, from which it extends a short distance posteriorly in a horizontal direction as far as the posterior extremity of the centrum of the same vertebra. From the inner side of its distal extremity there extends posteriorly a simple rod-like bone to a point in line with the anterior margin of the vent. Its length is about equal to that of the superior element. The superior element is ilium, but the inferior does not appear to be either pubis or ischium. Its position and direction are not inconsistent with its identification with the femur; but as it occurs in snakes, which have a rudimental femur, it can not be that bone.

Observations.—The inferior element in the pelvis in this genus is the same as that which I described as occurring in the African form of this family, *Feylinia* (*Anelytropsis* Hallowell), but the latter differs in the absence of the rib-like ilium. It is interesting to notice the resemblance between these genera, which are so widely removed geographically. *Feylinia*, however, differs further from *Anelytropsis* in the presence of a pair of clavicles.

Feylinia currori Gray. Described by me.¹ From West Africa.

Scapular arch.—This consists of a pair of osseous clavicles which nearly meet on the median line. The anterior ribs to the number of seven pairs meet on the median line by their cartilaginous hæmapophyses, which are directed forward at an acute angle, the angle of the anterior pair intervening between the clavicles.

Pelvic arch.—This consists of a single element lying on each side of the vent antero-posteriorly, perhaps homologous with the corresponding element in the *Annulati*. It is in contact with the distal extremities of three ribs, and is connected by ligament with a third anterior to them. These are the last ribs, and they are followed by a pair of sacral vertebræ whose diapophyses are united distally.

¹ Proc. Acad. Nat. Sci. Phila., 1864, p. 230.

Remarks.—This pelvic element is probably the iliopectineal element of Fürbringer. The pelvis differs from that of *Anelytropsis* (*antea*) in the absence of iliac element.

ANELYTROPSIS Cope.

Anelytropsis COPE, Proc. Amer. Phil. Soc., XXII, 1885, p. 380.—BOULENGER, ('at. Liz. Brit. Mus., 2d ed., II, p. 430.

Rostral plate capping muzzle, the nostril at the junction of its posterior border with the suture separating the loreal and first labial. No frontonasal nor supraorbital plates. Three plates on top of head, which should probably be identified as anterior and posterior frontal and parietal. Eye scarcely visible through the single ocular plate. Scales equal, smooth. Vent not terminal. No limbs. No preanal pores.

This genus only differs from *Feylinia* Gray (= *Anelytrops* Hallowell) in the arrangement of the lateral plates of the muzzle. In that genus and *Typhlosaurus*, the only other genus of the family, the rostral plate is as in *Acontias*; that is, divided longitudinally on each side by a fissure which extends from the nostril posteriorly. Whether the internal characters differ remains to be ascertained.¹ I give the genus the name *Anelytropsis* in order to justify the family name Anelytropidæ. This will produce no confusion, as the name *Anelytrops* was given by Hallowell to the genus which had previously been named *Feylinia*, and as a synonym disappears from view.

The present form is essentially interesting as a representative of the family of the Anelytropidæ, or the Typhlophthalm lizards with the eye entirely concealed, and with the tongue scaly. The importance of this discovery is considerable, as it shows that the scincoid lizards have undergone in the New World the same degenerative process as in the Old World, and in the same way. This is a new fact, even supposing that the Anniellidæ of America are a degenerate form of the same family, which is not probable. Dr. Boulenger believes that that family is a degenerate type of the Anguid stem—a view in which I suspect he is correct. *Anelytropsis* is a degree farther down in the scale than *Anniella*, in having the epidermis absolutely continuous over the eye, as in other members of the family of Anelytropidæ, and as in the Typhlopod family of snakes. As in other forms of this character, the life of this type is doubtless subterranean, which accounts for its having so long escaped observation.

¹I have given the skeletal characters of *Feylinia* and *Typhlosaurus*, Proc. Acad. Nat. Sci. Phila., 1864, p. 224.

ANELYTROPIS PAPILLOSUS Cope.

Anelytropis papillosus COPE, Proc. Amer. Phil. Soc., 1885, p. 380, pl. fig. 9.—
BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 431.

Form slender. Tail moderately long, with obtuse extremity. Scales scincoid, with rounded edges, everywhere equal, including the preanal region. Color brownish flesh color.

The head is distinguishable from the body by its slightly greater width, and is slightly contracted at the position of the orbits, and continued as a distinct muzzle. The body is cylindrical, and the tail is a little longer than one-fourth the total length. Twenty longitudinal series of scales. The area represented by the rostral plate of *Acontias* is invaded on each side by two labial plates, and a large loreal above them. Behind the second labial plate is a very small third, and above it is a large ocular plate which extends upward and forward to a line with the superior border of the loreal. The pale spot which represents the eye is situated in the lower posterior corner. The fourth and last labial is a little larger than the second, and has a narrowly rounded posterior extremity. Above it is a small postocular, which is in contact with the posterior frontal. On the summit of the head there are three scuta. The anterior, or anterior frontal, is the smallest. It forms a transverse band between the loreal and ocular of one side and those of the other. The succeeding plate, the postfrontal, is the largest. It is succeeded by the parietal, which is a transverse plate, concave in front and convex posteriorly, and which is separated from the postocular on each side by a single scale. Posterior to this scute, the scales of the body begin.

There is a large symphyseal plate which is a triangle with its apex posterior and truncate. It is bounded on each side by a very large inferior labial, which is also a triangle. This is followed on the labial margin by two very small labial plates. A small body scale succeeds the symphyseal, and this is connected with the small posterior labials by a narrow plate on each side. These are followed by the body scales. Six laterally imbricated scales bound the vent in front.

Measurements.—Total length, 170 mm.; length of tail, 45 mm.; of head, to line connecting *rictus oris*, 41 mm.

The rostral, loreal, and anterior two labial scuta are marked with minute papillæ, which, when removed, leave punctiform impressions. They are not very closely placed. Two specimens from near Jalapa. None in the U. S. National Museum.

DIBAMIDÆ.

Dibamida BOULENGER, Ann. and Mag. Nat. Hist. (5), XIV, 1884, p. 120; Cat. Liz. Brit. Mus., 2d ed., III, 1887, p. 434.

Scincoidiens typhlophthalmes DUMÉRIL and BIBRON, part, Erp. Gén., V, 1839, pp. 525, 832.

Typhlinida GRAY, part, Cat. Liz., 1845, p. 128.

Dr. Boulenger gives the following description of this family:

Tongue short, bifid posteriorly, pointed, undivided in front, covered with curved lamellæ or plicæ. Teeth small, pointed, hooked, none on palate. Skull compact; no interorbital septum; no columella cranii; no arches; no infraorbital foramen; premaxillary double. Limbs absent, the hind pair represented in the male by a pair of flaps on the sides of the anal opening; no rudiments of the sternal apparatus. Body vermiform, covered with cycloid, imbricate scales. No osteodermal plates. Eyes concealed under the skin. No ear opening. No preanal pores.

A single genus, which appears to stand in the same relation to the Scincidæ as *Anniella* to the Anguidæ.

SYNOPSIS OF THE GENERA.

Snout normally covered by three large shields, viz, the rostral, and a labial on each side, which, however, may fuse into a single shield. Nostril pierced in the rostral, with a straight horizontal suture behind it. Limbs totally absent in the female, the hind pair represented in the male by two flap-like rudiments.

Dibamus Duméril and Bibron.

But two species of *Dibamus* are known, the *D. novæguineæ* Duméril and Bibron, from New Guinea and adjacent islands and the *D. nicobaricus* Steindachner from the Nicobar Islands.

ANNIELLOIDEA.

Annielloidea GILL, Smithsonian Report, 1885, 1886, p. 800.

Anguisauri COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 25.

Petrosal bone produced anterior to the anterior semicircular canal, articulating with the margin of the decurved parietal. Olfactory lobes underarched by frontal bones; no supratemporal. Occipital closely articulated with parietals. Cervical and caudal intercentra coossified with the centra. Palatine and pterygoid foramina present. Tongue papillose; no ceratohyals.

This superfamily is, as already indicated, allied to the Annulati, but is distinguished by the characters given in the analytical table of superfamilies on p. 200, as well as by various others of less significance.

There is but one family, which is characterized as follows:

An eye fissure; scales present; teeth subpleurodont; no limbs; no postorbital arch; splenimental groove closed. ANNIELLIDÆ.

ANNIELLIDÆ.

Anniellidæ COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 230.

Anniellidæ BOULENGER, Ann. Mag. Nat. Hist. (5), XIV, 1884; Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 299.

Tongue villose, the anterior extremity smooth and bifid. Teeth with simple acute crown and with short swollen base. Skull lacking

the presphenoidal vacuity and consequently the interorbital septum, and the bones which constitute the brain case firmly united; a columella cranii, no supratemporal; postorbital arch ligamentous, pterygoids not in contact with sphenoid; a palatine foramen; premaxillary single; nasal and frontal divided; parietal single; preorbital and postorbital in contact, separating the frontal from the border of the orbit.

The viscera display the following characters in the genus *Anniella*: The left lung is much smaller than the right lung, and is proximally fused with it so that there is but a single lumen. Right lung much enlarged and covering the alimentary canal below (ventrad). Liver considerably posterior to heart, long and narrow, with a small left lobe and a long right lobe extending to the reproductive cells. Gall bladder inclosed by the liver and exposed inferiorly, that is, occupying a foramen, as in the *Diploglossa*. Alimentary canal distinguished into stomach, and small and large intestine, without distinct colon. Stomach without curvature; small intestine moderately plicated, with lacertiform mesentery. Reproductive cells anterior, symmetrical; kidneys symmetrical, posterior. There is a single gastrohepatic mesentery from the middle line of the liver, and no right hepatic or lateral hepatics. Hepatoventral simple; plates of epigastric very loosely attached together. No pulmonaries at middle of liver.

The fusion of the lungs is a peculiarity that I have not noticed elsewhere among the Sauria. The left lung is like a diverticulum of the right, and posterior to the point of divergence from the latter is bound to it by connective tissue to the extremity. This fusion is a step nearer to obliteration than occurs in any of the serpentiform genera of Teiidae, Scincidae, or Anguidae, where, though of reduced size, it is distinct from the right except at its proximal extremity.

The affinities of the *Anniellidae*, as indicated by the osteology, are interesting. When I first, in 1864,¹ pointed out the cranial peculiarities of the genus *Anniella*, I created for it a distinct family, which I associated with the *Acontiidae* and *Anelytropsidae*. Subsequently, in 1887,² I proposed for it a still more independent position, making it the type of a special superfamily, which I called the *Anguisauri*; a course which had been already adopted by Gill a short time previously,³ who proposed for it the superfamily of the *Annielloidea*. The further knowledge of its structure above recorded brings out more clearly its true position which I gave it in 1892.⁴ This is, I think, in the *Annulati* or *Amphisbænia*. The characters which indicate this reference are: (1) The continuity of the parietal with the petrosal and supraoccipital elements. (2) The absence of ceratohyal elements. (3) The hypophyses of the cervical vertebræ which are continuous with the centra.

¹ Proc. Acad. Nat. Sci. Phila., 1864, p. 230.

² Bull. U. S. Nat. Mus., No. 32, 1887, p. 25.

³ Smithsonian Report, 1885, 1886, Progress of Zoology for 1885, p. 40.

⁴ Proc. Amer. Phil. Soc., p. 216.

(4) The partially open chevron bones, which are also continuous with the centra. (5) The position of the lung ventral to the alimentary canal.

There is agreement in various subordinate features, as the single premaxillary, double frontal, and single parietal; and the absence of supratemporal bone; also the fusion of the surangular and articular bones. There are some differences to be noted. Thus, in some of the *Amphisbænia* at least, there is apparently an orbitosphenoid bone, which is wanting in *Anniella*. The pterygoid is more closely adherent to the basis cranii in the *Amphisbænia*, and there is no palatine foramen, which is present in *Anniella*. The splenial is of full size in *Anniella* and the Meckelian groove is open. In the *Amphisbænia* the groove is closed and the splenial is much reduced. There is no epipterygoid in the typical *Amphisbænia*.

The presence of scales, the papillose tongue, and the distinct tegumentary eye fissure, with the characters above cited, define the *Anniellidæ* as a very distinct family of the *Amphisbænia*. The presence of all the pelvic elements allies it to the *Chirotidæ* rather than to the *Amphisbænidæ*.

Since my examination of the osteology of this genus Dr. G. Baur has reexamined the subject¹ and has added somewhat to our knowledge of it. He discovered the epipterygoid and the jugal, and finds a rudimentary pubis and ischium "which are united proximally." He states that "the pubis has an obturator foramen," but what this means is not explained. He alleges that my description is not correct, but he indicates no error except the omission of the elements mentioned. Some sutural lines were omitted from my figure, which are now inserted.

But one genus of the *Anniellidæ* is known, which has the following characters:

Body vermiform; no limbs. Eyes represented by a fissure; ears concealed. No pre-anal pores. Scales soft, cycloid-hexagonal, imbricate; nostril in a single plate.

Anniella Gray.

There are some characters of the skeleton of the genus *Anniella* in which it differs from the known forms of *Euchirotidæ* and *Amphisbænidæ*, whose value is uncertain. These are: (1) The internal gomphosis of the supraoccipital bone into the parietal; it is external in other *Annulati*. (2) The angular bone is chiefly exposed on the external side of the mandibular ramus. (3) There is no hypohyal process of the basihyal.

¹ Proc. U. S. Nat. Mus., 1894, p. 345.

ANNIELLA Gray.

Anniella GRAY, Ann. Mag. Nat. Hist. (2), X, 1852, p. 440.—COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 230.—BOCOURT, Miss. Sci. Mex., Rept., 1881, p. 460.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 299.

Body cylindrical, elongated, without limbs. No trace of lateral groove nor of external ear. Head very short; depressed; cleft of mouth rather short. A broad frontonasal plate in extensive contact with a fused frontal and frontoparietals. A small interparietal in a notch of the latter. Nasal in the center of a single plate which comes to the edge of jaw. Eye distinct, but closed by the oppressed inferior eyelid.

The more detailed osteological characters are as follows. They are derived from specimens from San Diego, California, collected and presented to me by my friend, Mr. James S. Lippincott.

The premaxillary has an elongate spine, and the palatal suture presents backward two concavities separated by a median projection. The nasals are distinct and rather short and wide. The frontals are distinct and rather wide. The parietal is very large every way, is single, and has no pineal foramen. The supraoccipital forms a close suture with it, sending forward a median process for internal gomphosis, and an angle on each side of it. It is coossified with the exoccipital and is expanded to accommodate the large circle of the superior semicircular canal. The facial plate of the maxillary is large. The prefrontal is above the eye and is cut off from the parietal by an entrant angle of the frontal only. The lachrymal is small and is below and separated from the prefrontal. Jugals narrow, lying on the superior aspect of the maxillary, terminating freely. Postfrontal crescentic, bounded by both frontal and parietal. Postorbital a caducous scale lying in contact with the posterior limb of the postfrontal. A supraorbital bone external to the prefrontal. Petrosal with its superior border in close contact with the decurved lateral borders of the parietal, as in a snake. The latter do not, however, descend to the presphenoid, but leave a wide fissure below it which deeply notches the anterior border of the petrosal. Supraforaminal part of petrosal produced to an acute angle, terminating at the parietal border much in advance of the anterior semicircular canal. Body of petrosal perforated by a large foramen just in front of the superior part of the quadrate. No parietoquadrate arch, but a posteroexternal angle of the parietal extending near to the proximal extremity of the quadrate. No distinct supratemporal or paroccipital.¹ Stapes with large disk and short, stout columella, with thickened tympanic extremity. Maxillopalatines continuous anteriorly, slightly divergent posteriorly; excavated by a deep groove posteriorly, which terminates in a fossa medially. The external borders of the posterior apices are turned out-

¹ Baur states that the paroccipital is present, but I have not been able to find it (Proc. U. S. Nat. Mus., 1894, p. 349).

ward, so as to inclose partially the posterior nares below. The palatines are short, the groove separating the maxillary from the vomerine processes extending to the suture with the pterygoid, so that the maxillary process only appears as the inferior face of the bone. Pterygoids elongated anteriorly, reaching to beyond the middle of the palatine foramen. They extend directly back to the quadrates, being well separated on the middle line, and abruptly notched on the inner side to receive the short, angular basipterygoids. They are separated from the sphenoids by a fissure, and are grooved on the inner side posterior to the basipterygoid. Ectopterygoids present, rather slender, inclosing rather large palatine foramina. Epipterygoid small. Narial fissure overhung by the free edge of the maxillary and palatine bones. Sphenoid and basioccipital and exoccipital coossified. Occipital condyle convex and perfectly simple.

The mandible has an open Meckelian groove, and the surangular and articular bones are coossified, while the angular and splenial bones are distinct. The latter extends well anteriorly. The coronoid extends a little forward on the exterior face of the ramus and in both directions on the inner face.

The hyoid apparatus is the most simple among lizards. It consists of a continuous cartilaginous glossobasihyal rod, which is bifurcated posteriorly, and a simple osseous first branchihyal attached to each of the branches. Other elements wanting.

Ten cervical vertebræ with compressed inferior processes of the centra, or hypapophyses. They are coossified with the centra and are not intercentral in position, hence it is not evident that they are intercentra. No zygosphen. In the *Anniella pulchra* there are seventy-three rib-bearing vertebræ and two cervicals without ribs. The sacral and proximal caudal vertebræ have diapophyses, those of the former little different from those of the latter. The fifth vertebra with a diapophysis supports a pair of parallel plates coossified with its inferior face like the chevron or double hypapophysis of a snake. In the succeeding vertebræ similar plates form the basis of a chevron, whose symphysis is turned rather abruptly posteriorly. The position of these chevrons is central and not intercentral. Caudal vertebræ not segmented.

Scapular arch wanting; pelvic arch mediventral; no limbs. The ilium is represented by a small and short rod like bone, which is attached to the extremity of the diapophysis of a single vertebra. The proximal extremity is directed backward for a short distance posterior to the point of suspension, as in *Anelytropsis*. According to Baur, there is a rudimentary ischium and pubis, "which are united proximally." No trace of posterior limb. Teeth simple, acutely conic.

The hemipenis is not bifurcate. It is surrounded by transverse laminae or flounces, which are crimped so as to be slightly pocketed. The organ resembles that of *Gerrhonotus*.

Three supposed species have been described, but I believe that two of them are referable to a single, rather variable form.

The range of the genus is confined, with present knowledge, to the southern part of the Pacific district.

ANNIELLA PULCHRA Gray.

Anniella pulchra GRAY, Ann. Mag. Nat. Hist. (2), X, 1852, p. 440; Zool. Herald, p. 154, pl. XXVIII.—COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 230.—BOCOURT, Miss. Sci. Mexique, Reptiles, p. 460, pl. XXII G, fig. 2.—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 299.—COPE, Proc. Amer. Phil. Soc., 1892, p. 215, pl. II, fig. 4.

Anniella nigra FISCHER, Abhandl. Naturwiss. Ver. Hamburg, IX, 1885 (separate copy, p. 9).—BOULENGER, Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 300.

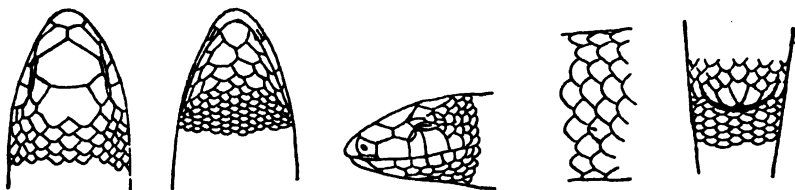


Fig. 138.

ANNIELLA PULCHRA GRAY.

× 3.

Cat. No. 16022, U.S.N.M.

Body depressed cylindric; tail obtuse, about one-half as long as body, but varying somewhat in length. Scales smooth, everywhere equal, in generally thirty rows, but sometimes in twenty-eight and even twenty-six. Head but little wider than body posteriorly, contracting radially to an obtuse, moderately depressed muzzle, which projects beyond the lower jaw. Preanal scales generally larger than those which precede them, but not much.

Rostral plate bounded posteriorly chiefly by the nasals, but also at the apex by the internasoloreal line, which have a short common suture on the middle line. Posterior to these there is a frontonasal, which is wider than long. Posterior to this is a large plate, probably composed of the fused frontal and frontoparietals. This is notched on the posterior border for a small interparietal. Posterior to these plates is a series of five smaller ones, of which two laterals on each side may be regarded as parietals, and the median an occipital. Posterior to these a few scales are larger than those of the body generally.

There are six superior labials, of which the first is beneath the nasal and part of the rostral, and is very narrow. The second is the largest and is longer than high, and is bounded above by the loreointernasal and the first and second preoculars. The third, fourth, and fifth labials are higher than long, and the third and fourth reach the eye, unless cut off entirely (which it is always in great part) by the inferior preocular. Nasal triangular with the apex posterior, deeper than long. Nostril rela-

tively small. Superior preocular long; inferior preocular quite small. Supraoculars two, the anterior larger than the superior preocular, and joining the posterior border of the frontonasal by a suture nearly equal to that with the frontal, and separated from the opposite supraocular by a space greater than its own width, but not twice as great. Three small superciliaries; two squamiform postoculars.

Six inferior labials, which are subequal except the last two, which gradually diminish. A large symphyseal, which is as broad as long. It has two subequal facets on each side for the first labial and the first infralabial, the latter large, and meeting on the middle line. The remaining infralabials of the first series are three in number and are quite narrow. There is a second series of infralabials posterior to the first, consisting of three scales on each side. Those of the first pair are large, and are in contact on the middle line; the second is smaller and subtriangular, and the third is smallest and narrowest in form. The regular squamation begins posterior to these.

The closed inferior eyelid is covered with three scales, of which the median is the largest.

Preanal plates five, the median wedge-shaped, with the apex posterior.

There are two color varieties as follows:

Var. A, *nigra*: Upper half of body uniform dark purplish brown; beneath, yellowish white; scales slightly dotted with brown along their lateral edges, especially under the tail. Chin, throat, and across anal slit dusky (*A. nigra* Fischer).

Var. B, *pulchra*: Lighter with three dark lines; a dorsal and lateral. Sometimes with fainter lines on the adjacent edges of all the rows of scales; the ground color above yellowish gray or ash.

Specimens from Monterey are uniform purplish brown above, yellowish white below. Cat. No. 3188, from San Francisco, is rather lighter, with three narrow dark lines, one on the middle of the back on the adjacent edges of the two central rows of scales; the other on the adjacent edges of the fifth and sixth rows from the middle. Below this are some less distinct lines on the sides. Smaller specimens from San Diego have, in addition to these, fainter lines along the adjacent edges of every row of scales.

The characters of this species are tolerably constant. In six specimens out of seventeen, I find the small preocular absent. The length of the tail in seven specimens varies from four-elevenths to one-third the total length.

Dr. J. G. Fischer¹ has described a specimen of Var. A as a distinct species under the name of *A. nigra*. Besides the color characters, he finds it to differ in the shorter tail, and in the longer preanal scales. The tail in his specimen of *A. nigra* is one-third the length, while in his single specimen of *A. pulchra* it is two-fifths of the same.

¹ Abhandl. Naturwiss. Ver. Hamburg, IX, 1885 (separate copy, p. 9).

I have seen no example with the tail as long as the latter specimen, but a proportion of four-elevenths is met with alike in dark colored and pale individuals. The difference is not important. The length of the anal scales varies within the limits mentioned by Dr. Fischer. In some specimens these scales are a little longer than those in front of them, and in one pale example (Cat. No. 12555) they are twice as long.

Dr. Boulenger describes¹ a specimen said to come from El Paso, Texas, as the type of a distinct species which he calls *A. texana*. The characters which he gives are mainly those of the *A. pulchra*, but there are a few differences. Thus the nasal plate has a suture extending posteriorly from the nostril to the border, and the interparietal and occipital plates are divided by a longitudinal suture. The head is said to be less depressed and the snout more rounded than in the *A. pulchra*. The presence of the sutures above mentioned may be anomalous, but if the form of the head be essentially different from that of the *A. pulchra* they might be constant. I have never observed them in any specimen of the *A. pulchra*. Without figures it is difficult to estimate the significance to be ascribed to the form of the muzzle. The locality will require verification, as it is out of the range of most of the Californian forms. We will await further information before forming an opinion as to the value of this form.

This pretty species considerably resembles the "blind worm" of Europe in form and appearance, but has no affinity with it, representing a different saurian phylum. Of its habits nothing is known. Its habitat is restricted to the Pacific district from San Francisco southward, including San Diego.

Anniella pulchra Gray.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
3185	2	San Diego, California .....	.....	Dr. LeConte	
3187	2	Monterey, California .....	.....	A. S. Taylor	
3188	5	San Diego, California .....	.....	Dr. Hammond	
3190	1	Coast mountains near San Diego.	.....	General Emory	
3188	1	San Diego, California .....	.....	Mr. Cassidy	
3188	1	San Francisco, California .....	.....	R. D. Cutts	
3189	1	do .....	.....	do	Alcoholic.
4690	1	Monterey, California .....	.....	A. S. Taylor	do.
11575	1	do .....	.....	Lieut. Mullen, U. S. A	do.
11874	1	San Diego, California .....	.....	Prof. D. S. Jordan	do.
9741	1	Kern County, California	May —, 1878	J. R. Shepherd	do.
12555	2	Fresno, California .....	.....	(?) .....	do.
13838	2	San Diego, California .....	.....	C. E. Orout	do.
13890	4	do .....	.....	do	do.
13939	1	do .....	.....	R. E. C. Stearns	do.
13959	1	do .....	.....	do	do.
14712	2	San Bernardino, California .....	.....	F. Stephens	
16022	.....	.....	.....	.....	

¹ Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 300.

ANNIELLA TEXANA Boulenger.

Anniella texana BOULENGER, *Annals and Magaz. Nat. Hist.*, Lond., XX, 1887, p. 50.

The following description is copied from Boulenger:

Head less depressed, snout more rounded than in *A. paucira*. Nasal shield semi-divided, a horizontal suture extending from the nostril to the second labial; frontal twice as broad as long; anterior supraocular nearly as broad as the distance which separates it from its fellow; interparietal and occipital divided (anomalously?) by a longitudinal suture; six upper labials—first very small, below the nasal, second largest and in contact with the prefrontal and a loreal, third and fourth entering the eye; a narrow shield separates the third labial from the loreal; five lower labials. Twenty-eight scales round the middle of the body. No enlarged preanal scales. Tail ending obtusely, three-eighths of the total length. Dark gray above with three fine black longitudinal lines; sides and lower surfaces whitish.

From snout to vent, 145 mm.; tail, 85 mm.

A single specimen from El Paso, Texas.

ANNULATI.

Annulati WIEGMANN, *Herpt. Mex.*, 1834, p. 4.

Amphisbæna GRAY, *Cat. Tort. Croc. and Amphisbæniæ* Brit. Mus., 1844, p. 68.

Opheosauri COPE, *Proc. Acad. Nat. Sci. Phila.*, 1864, p. 226; *Bull. U. S. Nat. Mus.*, No. 32, 1887, p. 25.

Parietal bones laterally decurved, and continuously united with petrosal by suture, and fused on the middle line, frontals inclosing olfactory lobes of the brain below. No cranial arches, vertebræ procœlous; the cervicals with coossified hypapophyses on the middles of the centra. Chevrons coossified with the middle of the centra, the anterior without symphysis.

The visceral characters are as follows:

One lung, apparently the left, which lies ventrad of the alimentary canal. Liver situated much posterior to the heart, very elongate, distally bilobate, the right lobe much longer than the left. Gall bladder situated in the notch between the lobes of the liver. Stomach not turned to the left; small intestine elongate, terminating in a large intestine which is imperfectly distinguished into colon and rectum. Kidneys posterior, symmetrical; a urinary bladder. Corpora adiposa present, free. Ventral mesentery extending from heart to distal extremity of liver, hence elongate; dorsal mesentery following the plications of the intestine and not binding them into a simple mesenteric pouch, as is seen in the Serpentes.

Subordinate modifications are observable in different types. Thus, in *Amphisbæna alba* and *A. fuliginosa* there is a short cæcum, and the corpus adiposum is subdivided. In *Rhineura floridana* there is no cæcum, and each corpus adiposum is undivided.

This superfamily embraces the most snake-like of the Sauria. This affinity is seen in most parts of their osseous structure, in the inclosure of the brain case by the frontal and parietal bones in connection with the petrosal, the absence of supratemporal, the numerous coossified

hypapophyses of the cervical vertebræ, and the open central chevrons of the caudals. The peculiar pelvic bone differs entirely from that which is seen in genera of Anguidæ, which are equally without posterior limbs, and is only approached by that of the Anelytropidæ among other lizards. It more nearly resembles a corresponding element in the peropodous snakes, when a rudimental ilium and pes are also present, and the Typhlopidae (Fürbringer), where no rudiment of leg exists. Its nearest point of affinity to the other Sauria is seen in the Anelytropidæ.

The contents of the superfamily includes four families, which fall into two groups, as follows:

I. Scales present; an eye-fissure; tongue papillose; teeth pleurodont; no limbs.

ANNIELLIDÆ.

II. No distinct scales nor eye fissure; tongue scaly:

Teeth pleurodont; anterior limbs..... EUCHIROTIDÆ.

Teeth pleurodont; no limbs..... AMPHISBENIDÆ.

Teeth acrodon; no limbs..... TROGONOPHIDÆ.

The above families agree in several characters not included in the above diagnosis of the superfamily. Thus, all have a single premaxillary, but double nasals and frontals. The premaxillary is in contact with the vomer. The articular and surangular bones are united, while the angular is distinct. The coronoid bone has little horizontal extent on the external face of the ramus.

All the forms are vermiform and of subterranean habits.

Boulenger thinks that the Amphisbænidae are allied to the Teiidae through such forms as *Ophiognomon* and *Microdactylus*. I have already pointed out the characters of this type under the Teiidae in describing the anatomy of the genus *Propus*. There is nothing especially Amphisbænian other than what may be observed in serpentiform lizards of several families, although the external appearance of these Teiid forms is in favor of such a view. *Anniella*, the least typical of the Annulati, is nearer to the Diploglossa in the character of the tongue, and it is not unlikely that it is to this group after the Annulati that it is most nearly allied, as remarked by Boulenger in the Catalogue of Lizards of the British Museum.

EUCHIROTIDÆ.

Chirotidae GRAY, Cat. Tort., Amphisb., Brit. Mus., 1844.

Three genera of this family are known as follows:

Digits, five; all clawed..... *Euchirotes* Cope.

Digits, five; one smaller and clawless..... *Bipes* Lacépède.

Digits, three; clawed..... *Hemichirotetes* Dugès.

Each of these genera includes a single species, which is characterized as follows:

Euchirotes biporus Cope. Tail twice as long as head; anus preceded by a transverse series of six large plates, which extend to the abdominal scuta; a single preanal pore each in a single scale in front of the external preanal plate. Nasal plates nearly in contact in front. Cape St. Lucas, Lower California. U. S. National Museum. G. Eisen.

Bipes canaliculatus Lacépède. Tail twice as long as head; preanal scuta small, preceded by a transverse row of small scales, each of which is perforated by a pore. Nasal plates well separated in front. Mexico.

Hemichirotres tridactylus Dugès. Tail but little longer than head; anus preceded by six plates of moderate size, and these by only two pore-bearing scales on each side. Nasal plates widely separated by contact of rostral and inter-nasal. Guerrero, Mexico. A. Dugès.

EUCHIROTES Cope.

Euchirotes COPE, American Naturalist, 1894, p. 436.

Digits five, all clawed; nostril in a single plate. Preanal pores. Rostral plate not prominent. Eye minute, no eyelids.

The characters of the scapular and pelvic arches in this genus are as follows:

Scapular and pelvic arch present; fore limbs, but no hind limbs.

Scapular arch.—For the first time in the history of scapular reduction we find the clavicle absent. No interclavicle nor precoracoid. Supraclavicle osseous. Clavicle and coracoid osseous, coossified; no coracoid cartilage. Sternum without costals, osseous, pentagonal, and with a long xiphoid process. Ulna and radius well distinguished.

Pelvic arch.—An elongate element on each side, directed downward and a little forward, principally ilium, but with a short free distal extremity, which represents one or both of the inferior elements. A short curved cartilage represents the femur. The ilium is connected by a cartilage with the extremity of a single diapophysis, and a short free segment corresponding to this cartilage articulates with the vertebra which follows.

The scapular arch of *Bipes canaliculatus* Lacépède has been described and figured by Müller,¹ and by Duméril and Bibron,² both with omission of pelvic arch. The description and figure which I gave³ as referring to that species, was really taken from the *Euchirotes biporus*, of the distinctness of which I was not at that time aware. Müller says of the former species "that the clavicle and scapula are fused into a single piece." This is probably an error, as there is apparently no clavicle, as may be seen by comparing the figures given in the present paper. Neither Müller nor Duméril and Bibron detected the rudimental pelvic arch. Before I was aware of the difference between

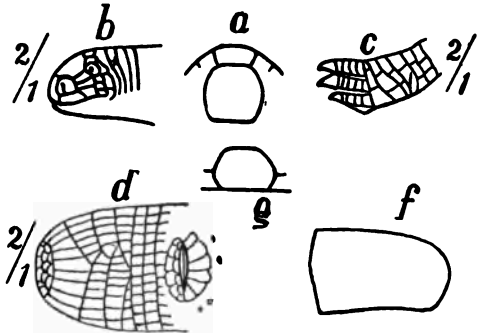


FIG. 139.
HEMICHIROTES TRIDACTYLUS DUGÈS.
× 2.
From Dugès.

¹ Zeitschr. f. Physiol., IV, 1831, pl. xxi, figs. 11, 12.

² Erpétologie Générale, Atlas, pl. VII, figs. 1, 2.

³ Journal of Morphology, 1892, p. 240.

Bipes and *Euchirotres* I thought this statement might have been due to badly preserved specimens, but it is quite possible that the two genera may differ in this respect.

In the *Euchirotres biporus* the liver is situated far caudal to the heart. Both extremities are bilobate, the caudal extremity unequally, as the right lobe is much produced. It is separated from the left by a deep fissure, and the gall bladder is exposed on the left side, and it is not inclosed as in *Anguidæ*. The trachea passes above the heart to a point a short distance beyond it, where, without dividing, it enters a single biauriculate lung. The lung lies entirely ventrad of the gut, and extends along the left side of the liver part of its length. The heart is halfway between the end of the muzzle and the caudal end of the liver.

The intestine presents two expansions proximad to the large intestine. The moderate constriction divides the latter into colon and section, and the former has a proximal cæcum. The corpora adiposa are large. The transverse section of the liver is crescentic. It is supported by a gastrohepatic mesentery, and a sheet on the right, which, as it arises from the hepatic border, may be a hepatolateral, but which is probably homologous with the right hepatic of other *Annulati*. A left gastropulmonary sheet. Hepatoventral single.

EUCHIROTES BIPORUS Cope.

Euchirotres biporus COPE, American Naturalist, 1894, p. 436, fig. 5.—VAN DEN BURGH, Proc. Cal. Acad. Sci., 1895, p. 135.

Chirotres canaliculatus STREETS, Bull. U. S. Nat. Mus., No. 7, 1877, p. 37.—YARROW, Bull. U. S. Nat. Mus., No. 24, 1883, p. 38.—COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 47.—BELDING, West Amer. Scientist, III, 1887, p. 97; not of Lacépède.

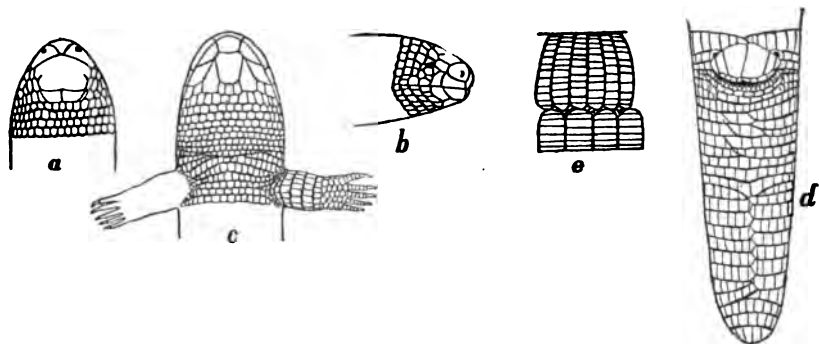


Fig. 140.

EUCHIROTES BIPORUS COPE.

× 2.

Lower California.

Cat. No. 12599, U. S. N. M.

The snout is short, rounded, and very convex. The limbs are very broad and short, with five perfect clawed digits. The larger head plates are a rostral, three labials, a nasal, an ocular, a preocular, two suboculars, one supraocular, a very large undivided prefrontal, and a

pair of frontals. There are also two small plates between the third labial and the suboculars. The anus is preceded by a transverse series of six longitudinal plates. There is a single preanal pore in a large plate in front of the external preanal plate of each side.

Measurements.—Total length, 199 mm.; limb, 8 mm.; tail, 18 mm.; head, 7 mm.

Rostral plate triangular, the apex touching the internasal. The latter is twice as wide as long, and the frontals are wider than long. The nasal is subtriangular, with an obtuse apex directed posteriorly. The nostril is anterior to the center. The first superior labial is as long as the two others together. The symphyseal is large and is succeeded by four inferior labials; the first largest, the second intermediate, and the third and fourth subquadrate much smaller. A large postmental longer than wide, which is bounded in front on each side by the first labial and for the greater part by a large infralabial, which separates it from the second labial. A band of fourteen scales between the angles of the mouth below and eighteen above.

The dorsal and abdominal scales are separated by a longitudinal groove which extends to the anus. The abdominal scales are about twice as long as the dorsals, one row answering to two of the latter, with an occasional opposition of the extremities of single rows as an exception. There are twenty-four rectangular divisions of each abdominal cross band, the terminal ones small and subtriangular. In a dorsal cross band there are twenty-nine transverse divisions. On the thoracic region the bands are interrupted on the middle line, alternating with each other and forming chevrons directed forward. The last gular band is short and convex posteriorly. The number of the bands is as follows: Gular, 7; thoracic, 4; abdominal, 138; caudal, 20. A few of the caudal may be alternate on the middle line. The preanal plates are unequal, the median pair being much the largest. The next external are nearly as long and are very narrow; the third or external pair one-half the size of the second. In front of it is a larger scale leaving the pore in its posterior region, and external to the latter are two small scales.

The fore limbs are annulate, with scales like those of the belly, in six bands, from shoulder to digits. Digits I, II, and III equal and two-fifths the length of the arm; IV shorter, and V shortest.

Measurements (Cat. No. 21325).—Total length, 202 mm.; total length of head to angle of mouth, 5 mm.; total length of tail, 20 mm.; total length of fore limb, 7.5 mm.

Euchirotes biporus Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8568 12599	1 12	La Paz, Lower California. do.....	 Feb. —, 1882	Dr. T. H. Streets, U. S. N. L. Belding	Alcoholic. do.

In alcohol this curious animal is of a uniform white. Its color in life and its habits are unknown. It seems to be not uncommon at Cape St. Lucas, Lower California.

AMPHISBÆNIDÆ.

- Amphisbænida* GRAY, Ann. Phil. (2), X, 1825, p. 203.
Amphisbænoidæ FITZINGER, Neue Classif. Rept., 1826, p. 24.
Angues WAGLER, part, Syst. Amph., 1830, p. 196.
Amphisbæna WIEGMANN, Herpt. Mex., 1834, p. 20.
Chalcidiens glyptodermes DUMÉRIl and BIBRON, Erp. Gén., V, 1839, p. 464.
Amphisbænida, *Lepidosternida*, *Chirotida* GRAY, Cat. Tort., Amphisb., Brit. Mus., 1844, pp. 69, 73, 74.
Amphisbænida COPE, Proc. Acad. Nat. Sci. Phila., 1864; Proc. Amer. Assoc. Adv. Sci., XIX, 1871, p. 237.—BOULENGER, Ann. and Mag. Nat. Hist. (5), XIV, 1884, p. 120; Cat. Liz. Brit. Mus., 2d ed., II, 1885, p. 430.

Dr. Boulenger gives the following description of this family:

Tongue moderately elongate, arrowheaded, covered with imbricate, scale-like papillæ, ending in two long, narrow, smooth points. Teeth large, few, ankylosed to the inner edge of the jaws; premaxillary teeth usually in odd number; no pterygoid teeth. Skull thick, strongly ossified, without interorbital septum, or columella cranii, or postorbital, or supratemporal arches; premaxillary single; nasals two; frontals two; parietal single, very large; an orbitosphenoid bone; quadratum very oblique or nearly horizontal, owing to the shortness of the postcoronoid part of the mandible; occipital condyle frequently divided. Vertebrae very numerous, depressed, all except the foremost without spinous processes. Pectoral arch imperfectly developed in *Chirotæ*, reduced to minute rudiments in the other (limbless) forms; pelvic arch reduced to minute rudiments. Worm-like, adapted to subterranean life; eyes concealed under the skin; mouth small, frequently inferior; no ear. Head covered with symmetrical plates; skin divided into soft, squarish segments, forming regular annuli. Tail short.

The shape of the skull varies considerably, according to the genera; in this respect *Blanus* appears to be least specialized, although the occipital condyle is divided, while it remains single (kidney shaped when seen posteriorly) in the otherwise more specialized *Acrodonta*. The mandible especially undergoes the greatest modifications, as may be seen from Gervais and Peters's accounts of *Blanus*, *Amphisbæna*, *Lepidosternum*, and *Monopeltis*. The angular bone is chiefly developed on the internal side of the ramus, and the splenial is very small. The coronoid is large and subtriangular, and is overlapped from behind by the surangular on the external face of the ramus. Meckel's groove is closed. The columella auris is robust. The paroccipital is present as a scale just above the quadrate.

All the members of this family are burrowers, and many live in ants' nests. They bore narrow galleries in the earth, in which they are able to progress backward as well as forward. On the ground they progress on a straight line, by slight vertical undulations, not by lateral movements, as in other limbless reptiles; the tail of many species seems to be more or less prehensile. The food of these lizards consists of small insects and worms. Little has been published on their habits, and all that is known of their mode of parturition is that *Anops kingii* is oviparous, and deposits its ova in ants' nests.

As many as sixty-one species are enumerated by Boulenger in the Catalogue of the British Museum; thirty-eight are American, out of which only one, *Rhineura floridana*, occurs north of the Tropic of Cancer, and four (*Amphisbæna* and *Diphalus*) in the West Indies. The

twenty-three other species inhabit Africa, with the exception of the three species of the genera *Blanus*, which belong to the Mediterranean district.

SYNOPSIS OF THE GENERA.

A. Segments of the pectoral region not differentiated.

1. The nasal plates lateral, separated from each other on the median line.

a. Nasals separated by the rostral.

Rostral with a median cutting edge, extending between the fronto-nasals *Anops* Bell.

Rostral flat, not extending between frontonasals *Diphalus* Cope.

aa. Nasals separated by the frontonasals.

Frontonasals united into one plate; no frontals *Blanus* Wagler.

Frontonasals united; frontals present *Cadea* Gray.

2. The nasal plates in contact with each other on the median line.

a. Preanal pores present.

Nasal plates distinct *Amphisbæna* Linnaeus.

"Nasal plates united." Gray *Typhloblanus* Fitzinger.

Nasals, frontonasals, and anterior labials united .. *Ophioproctes* Boulenger.

AA. Segments of the pectoral region more or less enlarged, or forming angular series.

Snout compressed *Geocalamus* Günther.

Snout depressed; nostril in a small, separate nasal; tail cylindrical.

..... *Monopeltis* Smith.

Tail depressed, above with rows of round tubercles *Rhineura* Cope.

Nostril pierced in the rostral *Lepidosternon* Wagler.

Anatomy.—The characters of the regions of the arches and limbs have the following characters in *Amphisbæna occidentalis* Cope:

No scapular arch nor limbs; a rudimental pelvic arch.

Pelvic arch.—This consists, in this species, of a slender bone in the abdominal wall, a little in front of the vent on each side, which is directed forward and inward, but without meeting its mate on the middle line. It has no articular connection with any other element. In *Amphisbæna alba* this element is similar, but is relatively shorter and more as figured by Fürbringer in the *A. fuliginosa*. This species has also, according to Fürbringer, a very rudimental scapula.

As the left lung only is present in this family, there is but one gastropulmonary mesentery. The liver has a crescentic cross section, and it is supported by two gastrohepatic mesenteries (*Amphisbæna alba* and *A. fuliginosa*), or by only one, and a right hepatic, or hepatolateral, as it may be (*Rhineura floridana*). There is but one hepatoventral.

The only species of which I have obtained a satisfactory hemipenis is the African *Monopeltis galeatus* Hallowell. The organ is bifurcate; each branch is marked with fine, close, transverse folds, while the region proximad of these has coarser folds directed transversely and obliquely.

Origin.—No information as to the origin of the Amphisbænidæ or of the Annulati was accessible until Dr. Baur in 1893¹ announced the discovery of two species in the Oligocene beds of South Dakota, where

¹ American Naturalist, 1893, p. 998.

skulls were found by Mr. J. B. Hatcher, of the Princeton exploring expedition. These crania represent two genera, *Rhineura* Cope, still existing, and *Hypsorhina* Baur, extinct, and both are more nearly allied to *Lepidosternum* than to *Amphisbæna*. The species are termed *R. hatcherii* and *H. antiqua*.

This interesting discovery explains the existence of *Rhineura* in Florida, and relieves us of the necessity of supposing an immigration of Lepidosternoid reptiles from the South American continent, a hypothesis which is the more difficult to sustain, since there are no *Amphisbænidae* in Mexico or the West Indies.

RHINEURA Cope.

Rhineura COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 75.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 459.

Body vermiform, without legs, no ears, and the eyes invisible. Body encircled by a succession of continuous whorls, divided into square plates. Pectoral plates rather larger than elsewhere. Teeth conical, distant, pleurodont, none on the palatine. Tongue fleshy, narrow, ovate, emarginate behind and slightly bifid anteriorly; attached except at the tip. Tail flat, with tubercles in transverse series. Nostril pierced in a distinct nasal plate.

Osteology.—A specimen of the *R. floridana* Baird from Volusia, Florida, furnishes the characters of the skeleton.

The alveolar border of the premaxillary is very short, and supports only one, a median tooth. The spine is divided into two portions, that below the projecting angle of the muzzle and that above it. The former is contracted a little by a process of the maxillary which enters from the alveolar portion, separating it from the nostril, which is inferior in position. It then expands a little, to form on the upper side of the muzzle a terminal expansion twice as wide as long. The nasals are distinct, and extend to the border of the muzzle, overroofing the nostrils. Frontals wide, distinct, deeply emarginate posteriorly for the parietal. Pre-frontal rather large, triangular, sending its apex posteriorly over the orbit and reaching the parietal. Its free border and a narrow band of the parietal form a *crista temporalis*, which do not unite on the middle line into a *crista sagittalis*. Parietal single, without pineal foramen, continuous laterally with the petrosal and alisphenoid, and posteriorly with the supraoccipital, from which it receives on the middle line a gomphosis. Supraoccipital bounding foramen magnum, of which it forms a rather narrow border. A small triangular bone at the extremity of the maxillary may be a jugal or a lachrymal. The alisphenoid and petrosal form the inferior part of the side walls of the brain case, and are separated from the pterygoids and presphenoid below them by a narrow fissure which is widest below the petrosal. The latter sends an angle upward and backward between the parietal and exoccipital. The exoccipital sends a prolongation (paroccipital?) downward and for-

ward, which gives articulation to the quadrate, bounding the fenestra ovalis above. The latter is large and is closed by the large disk of the stapes. The quadrate has no posterior proximal process, and is oblique proximally, but is more nearly vertical distally. In its posterior angle rests the club-shaped head of the robust *columella auris*.

The vomer presents at its anterior extremity a process which separates a transverse process from each maxillary, and enters a notch in the posterior border of the premaxillary. The vomers are plane in front, but become convex and separated by a fissure posteriorly, ending each in an acuminate apex lying on the presphenoid. The palatine is narrow and lies along the inner side of the ectopterygoid, consisting chiefly of its maxillary process; it is doubtful whether it possesses a vomerine process. Posteriorly it lies scale-like on the pterygoid, reaching nearly to the line of the quadrate. The narial fissure is nearly closed anteriorly, except a foramen-like portion at the anterior extremity. The presphenoid, sphenoid, and basioccipital are coossified. To these the pterygoid is closely appressed by the one side, while on the outer side the latter carries the narrow splint-like ectopterygoid as far as the maxillary. No palatine foramen. Occipital condyle simple, transverse, medially concave.

The mandible displays no Meckelian groove, and the splenial is small. The small angular is only visible on the internal side of the ramus. Surangular and articular confluent. Coronoid large, triangular, not concave below, and overlaid at base externally by anterior extremity of surangular; anteriorly not extended over dentary. Angle short, longer than wide, a little inflected, simple; its plane an angle of 45 degrees to that of the ramus.

The hyoid apparatus is very simple. It consists of a glossobasihyal cartilage which is deeply bifurcate posteriorly. At the posterior extremity each posterior limb sends a process forward, which is about half as long as the anterior elements, the hypohyal. No ceratohyal nor second ceratobranchial. A rather short and simple osseous first ceratobranchial on each side.

The vertebral column consists of many cervico-dorsals and a relatively small number of caudals. The second vertebra has a strong keel-like hypapophysis, which is also strong on the third, but which diminishes from that point so that on the sixth it is no longer perceptible. The first rib is short and is attached to the third vertebra. Diapophyses and neural spines very short. The ribs do not display a vertical process at the head as in *Lepidosternum octostegum*. Diapophyses very short and simple on caudal vertebræ. Caudal hypapophyses beginning on the anterior fourth of the caudal series, the halves at first widely separated. They soon converge downward, and finally touch, but are never coossified to form a chevron. Position on the middle of the length of the centrum. Rib-bearing vertebræ without trace of zygosphen.

Scapular arch absent. Pelvic arch represented by a single curved

rod on each side of and anterior to the vent, which is connected with the extremities of two ribs by ligament only. This is the ileopectineal bone of Fürbringer. No trace of posterior limb.

Teeth simple, conic; situated on premaxillary, maxillary, and dentary bones only. Premaxillary with but one, a median tooth.

The genus *Lepidosternum*, as typified by the *L. octostegum*, differs from *Rhineura* in that the nasal bones are excluded from the narial borders by the maxillary, and from contact with each other by the prolonged spine of the premaxillary. In both of these points *Rhineura* agrees with *Amphisbæna*. In *Lepidosternum* also there is a Meckelian groove, and the angle is turned vertically downward. In *Amphisbæna (fuliginosa)* there is a groove and no angle.

RHINEURA FLORIDANA Baird.

Rhineura floridana COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 75.—BOCOURT, Miss. Sci. Mex., Rept., 1882, p. 491, pl. XXIX I, fig. 1.—BOULENGER, Cat. Liz. Brit. Mus., II, 1885, p. 460.

Lepidosternon floridanum BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 255.—STRAUCH, M&L Biol. Ac. St. Pétersb., XI, p. 460.

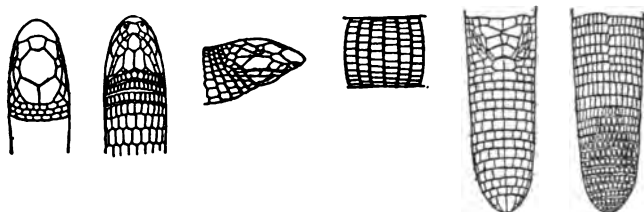


Fig. 141.

RHINEURA FLORIDANA BAIRD.

× $\frac{1}{2}$.

Florida.

Collection of E. D. Cope.

Body as thick as a large goose quill or larger. A large pentagonal plate on top of the head, encircled by nine others; the rostrum ending in a broad horizontal crescent overhanging the mouth. No ears. Tail one eighteenth the body; much depressed; its upper surface with the whorls covered by large tubercles set in smaller ones instead of by square flat plates.

Color yellowish white; in spirits; rose colored in life.

Body resembling somewhat a large *Ascaris*, white worm, in its uniform yellowish white color, absence of limbs, ears, and eyes, and succession of rings encircling it from head to tail. The head is contained about thirty-three times in the head and body and twice in the tail. It is ovoidal above, much depressed, the rostrum broad and projecting considerably beyond the lower jaw both terminally and laterally. A broad crescentic plate forms the tip of the rostrum. This may possibly be the frontal plate. Beneath this plate is a rostral which connects it with

the opening of the mouth, and on each side of this are three labials (four on one side) which become successively larger, the posterior as large as all the rest. Above the anterior of these are two other plates. On one side of the rostral plate, and above the first labial, is one with a nasal perforation in the center; but there is none corresponding to it on the other. Behind the terminal plate of the muzzle is a median one-half its width (vertical?), and behind this another (occipital?) as wide as the first. This is subpentagonal, with two large plates in front connecting it to the terminal one and separated by the second median plate described. On each side of this plate are two, the anterior very small, and with another immediately below it. This largest central plate is thus encircled by nine plates—three anterior, four posterior, and two lateral. The entire head, exclusive of the lower jaw, has about forty plates. The teeth are long, conical, recurved, and distant. There are about three on each side of each jaw.

There are four labials on each side the median mental, which has another plate behind it, followed by two long narrow ones. A long plate against the inner labials connects anteriorly with the latter.

The body is encircled by a succession of whorls or rings of close square plates, about thirty in number. These are narrower above and broader below on the pectoral region (for about six whorls) than elsewhere. There is a distinct groove or furrow along the back, with an occasional tubercle in it. One in the ventral surface is much less distinct. The tail is short, contained about seventeen or eighteen times in head and body. It is much depressed and rounded at the tip; verticillate, but the plates on the upper surface, except anteriorly, are tubercular, rounded and raised, set in the midst of smaller ones. There are fifteen caudal whorls on the under surface.

This very curious saurian form was first introduced into the North American fauna by Dr. Barratt, who found it at Micanopy, Florida, where it is said to be not uncommon, and to be frequently ploughed up in the potato patches. It is probably entirely subterranean in its mode of life. It has been since found in nearly all parts of the Floridan zoological district. Living specimens sent me by Mr. C. B. Moore are of a beautiful rose-purple color with a milky bloom, such as is seen on some fruits. Three distinct purple stripes radiate from the head posteriorly, but are soon lost in the surrounding color.

The specimens were sent me in damp sand, in which they burrowed and remained concealed. Unfortunately they lived but a short time, and a second sending met the same fate.

Rhineura floridana Baird.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
3202	1	Micanopy, Florida		Dr. J. B. Barratt	
8571	1	Manatee, Florida		N. B. Moore	Alcoholic.
8974	4	Florida			do.
8900	1	St. Johns, Florida	April--1877	Prof. S. F. Baird	do.
19993	1	Eustis, Florida		U. S. Fish Commission	
22318	1	Lake City, Florida		P. A. Rolfs	

TROGONOPHIDÆ.

Trogonophidæ GRAY, Cat. Tort. and Amphib., Brit. Mus., 1844, p. 68.—COPE, Proc. Amer. Ass. Adv. Sci., XIX, 1871, p. 237.

No limbs. Teeth anchylosed to the alveolar ridges.

The dentition of this family resembles that of the Acrodonta. It does not differ in other respects from the Amphibænidae. There are but three genera, and these are confined to the Old World. They differ as follows:

No preanal pores; two pairs of upper head shields; nostril pierced in a nasal.

Trogonophis Kaup.

Preanal pores; three large upper head shields besides the rostral; nostril pierced between two nasals.....*Pachycalamus* Günther.

Preanal pores; a single large upper head shield; nostril pierced in a nasal.

Agamodon Peters.

Trogonophis has but one species, which is found in northwest Africa. *Pachycalamus* has a single species, which is an inhabitant of the island of Socotra, off the coast of east Africa. The only species of *Agamodon* is east African.

SERPENTES.

I. ANATOMY.

THE OSSEOUS SYSTEM.

There is much uniformity in the characters of the skeleton in the Serpentes. Peculiarities characterize the principal divisions, but no definite groups can be traced in the great mass of the harmless snakes, so far as the skeleton is concerned.

Skull.—The premaxillary bone is connected with the skull by only its superior and inferior spines in all snakes except the Scolecophidia, where it is connected by suture laterally and inferiorly with the ethmoid also, and in the Epanodonta with the maxillary. In other snakes the ethmoid lies above its inferior spine. The nasals are always distinct from each other, except in *Charina*, where they are coossified. They are also free laterally, except in Scolecophidia, Tortricina, and many peropodous genera, where they are suturally united posteriorly and laterally with the prefrontals. Such are the genera *Loxocemus*,

Lichanura, *Charina*, and *Eryx*, and to these must be added *Xenopeltis*. The frontals are always distinct and the parietals are always united. The supraoccipital never enters the foramen magnum, which is bounded above by the exoccipitals. The prefrontals are articulated above with the frontals and, in the divisions above named, with the nasals also. The postfrontals are present, but are small and easily lost in preparing crania in some types. They are generally well developed, but are small in *Lichanura* and *Cylindrophis*, and are wanting in *Xenopeltis*, *Charina*, *Ilysia*, the *Scolecophidia*, and the *Elapidæ*. They are elongate and extended forward over the orbit to the prefrontals in *Achrochordidæ* and *Nothopidæ*. There is a supraorbital bone in the *Pythonidæ*. The paroccipital is included in the cranial walls in all anguiostomatous snakes, and is excluded from the brain case, lying scale-like on the surface, in the euryostomatous families. It is short in burrowing snakes, but elongates in other families, reaching an extreme length in the solenoglyphous division. The maxillary bone is loosely attached in *Serpentes*, having a close articulation with the prefrontal only, except in the *Epanodonta*, where it is fixed firmly to the premaxillary and vomers, as in lizards. It is shortened anteriorly in the *Proteroglypha*, and both anteriorly and posteriorly in the *Solenoglypha*, so as to become subvertical. Among the latter it is solid in all except the *Crotalidæ*, where it is deeply excavated by a fossa postero-exteriorly. In the *Opoterodonta* the maxillary is also very short and triangular, articulating very loosely with the prefrontal with its narrow apex. In snakes there are no lachrymal nor jugal bones. In proportion as the maxillary is abbreviated posteriorly, is the ectopterygoid elongated. The latter is generally a simple element, but in certain *Najid* genera it is deeply bifurcate anteriorly, according to Boulenger.

The lateral walls of the brain case consist apparently of the frontal, parietal, and petrosal bones, which articulate below with the presphenoid, sphenoid, and basioccipital elements. At the base of the orbital wall of the frontal is a longitudinal groove, bounded below by the presphenoid, which is occupied by the more or less persistent trabecula cranii. The optic foramen is large, and becomes a vacuity in types with large eyes, as *Bascanium*, and according to Boulenger those of opposite sides are confluent in *Psammophis*. The trigeminus foramen is represented by two, which communicate beneath a long bridge in all snakes, including *Typhlops* (*Glauconia* not examined). The quadrate bone presents some diversities of form, but none of great importance. In *Typhlops* it is short and flat, and presents a free angular process anteriorly. In *Glauconia* it is long and slender, and has no anterior process. In the *Tortricina* it is very short, and has in the *Ilysiidæ* a cylindric shaft. In *Asinea* it is generally flat and expanded at the proximal end, and has no angular process of the shaft, but in *Eryx* it is not expanded, and has a triangular section. In *Xenopeltis* it is short, and has a short posterior projection proximally, as in lizards. In the

boas and pythons it has a short anterior process on the inner side with which the columella auris articulates. The process is very short in *Eryx*, and an articular facet only remains in *Loxocemus*, *Lichanura*, and *Charina*. In the venomous snakes it is so elongate as to articulate with the superior disk of the paroccipital, extending to the inner border in the Solenoglypha.

The base of the skull presents certain diversities in the more distinct suborders.

There is much difference as to the extent to which the free edges of the presphenoid extend outside of the trabecular grooves, concealing them from view from below, or whether they are angulate or not. In some genera the basioccipital supports one to three hypapophyses for muscular insertion, and in a few genera the sphenoid bone supports basiptyergoid processes or tuberosities, accompanied or not with a median keel. In Solenoglypha the long median simple hypapophysis is constantly present, and in the Peropoda there are nearly always basiptyergoids. Beyond this these characters are specific only, or connected with the size and vigor of the individual. The following table will show this:

I. No basioccipital hypapophysis.

α. Basiptyergoid processes.

β. A median sphenoid keel.

Python, *Boa*.

ββ. No median sphenoid keel.

Loxocemus, *Eryx*, *Causus*.

αα. No basiptyergoids.

Typhlops; *Lichanura*, *Charina*; *Cylindrophis*; *Xenopeltis*; *Carpophiops*, *Cemophora*, *Abastor*, *Oseola*, *Storeria*, *Egina*, *Salvadora*, *Liopeltis*, *Cyclophis*, *Coluber* (*guttatus*); *Hydrophis*.

II. Three hypapophyses.

α. The median largest; *Eutania marci*.

αα. The lateral largest (weak); *Eutania proxima*, *Ophibolus sayi* (strong), *Zamenis constrictor*, *Z. flagellum*.

III. Two hypapophyses.

(Freak); *Nystia scytale*, *Elaps fulvius*.

IV. One hypapophysis, flat below.

Comptosoma corais, *Eutania sirtalis*, *E. saurita*.

V. A long compressed hypopophysis.

Vipera, *Ancistrodon*, *Sistrurus*, *Crotalus*.

The palatine bones differ considerably in the principal forms. The characters are seen in the presence or absence of the external (maxillary) or internal (vomarine) processes. These may be tabulated as follows:

I. Internal and external processes present. Colubridæ, Xenopeltidæ, *Charina*, *Python* (the internal small), *Glauconia*.

II. External process, but no internal. *Boa*, *Eryx*, *Loxocemus*, *Lichanura*.

III. Internal, but no external processes. *Elaps*, *Typhlops*.

IV. Neither internal nor external processes. *Hydrophis*, *Causus*, *Vipera*, *Ancistrodon*, *Crotalophorus*, *Crotalus*.

In all genera the palatine bone is longitudinal and compressed except in the Scolecophidia, where it is so short as to be transverse. The pterygoids are elongate and extend to the quadrate except in the Scolecophidia. In the Opoterodonta they are cylindric, and extend beyond the quadrate, while in the Epanodonta they are flattened and do not quite reach the latter. They are generally compressed so as to present a vertical lamina, but in peropodous genera, especially in those with basipterygoid processes, they are expanded inward so as to be horizontal. They are also horizontal in *Xenopeltis*. The compressed form is related to the greatest mobility, and is hence most developed in the Solenoglypha. Ectopterygoids are present in all the superfamilies except the Scolecophidia. They are longest where the maxillaries are shortest, that is, in the Solenoglypha.

The mandible in *Serpentes* always lacks the surangular bone, and the angular is small and far anterior to the angle of the jaw, which is formed by the articular. The coronoid is absent, excepting in the Scolecophidia, Tortricina, and Peropoda, except *Charina*, where it is wanting. The splenial is always present, and is internal exclusively, except in *Typhlops*, where it is more extensively developed on the external than on the internal side, leaving the dentary but a narrow strip. In *Typhlops* also the angular is a very small splint, between the splenial and the base of the coronoid on the external side of the jaw. The Meckelian groove is open in many snakes, and in others it is closed by the apposition of the edges of the dentary and splenial bones. In some species it is open only for a short distance. It is open in Crotalidæ, Viperidæ, and Hydrophidæ, and in Ilysiidæ, Boidæ, Pythonidæ, Charinidæ, and Xenopeltidæ. It is also open in the following genera of Colubridæ: *Natrix*, *Eutænia*, *Heterodon*, *Coluber*, *Ophibolus*, *Diadophis*, *Cyclophis*, *Liopeltis*, *Salvadora*, *Rhinochilus*, *Haldea*, *Virginia*, *Storeria*, *Abastor* and *Farancia*. In *Osceola* it is partly open; while it is closed in *Typhlops*, *Elaps*, *Causus*, *Sibon*, *Spilotes*, *Bascanium*, and *Carphophiops*. Thus the open groove is probably characteristic of Crotalidæ, Viperidæ, Hydrophidæ, the Peropoda, and the Homalopsinæ. Further than this no definite boundaries can be yet traced by it.

THE DIGESTIVE SYSTEM.

The teeth of snakes are not furnished with roots, and are not sunk in alveoli, but their bases are coossified with the bones which bound the mouth. They have simple, acutely conic crowns with an oval section, sometimes with a sharp angle posteriorly when a cutting edge is present. In certain genera (Opisthoglypha) there is a groove on the anterior or external face (*Ogmilus*) of the posterior one or two teeth of the maxillary bone. In one genus all the maxillary teeth are grooved (*Ogmodon*); while in the venomous species it is the anterior teeth which have undergone modification. In the Proteroglypha the anterior tooth is deeply grooved on the anterior face, and the edges of the groove have grown forward and inward so as to be in contact, thus

inclosing a tube. In the Solenoglypha this union has become complete fusion so that no trace of the primitive groove remains, although it is distinct in individuals at birth. The foramen at the anterior base of this tooth in Proteroglypha and Solenoglypha receives the papilliform extremity of the efferent duct of the salivary poison gland, and thus conducts the poison to the slit-like opening at the front apex of the crown.

The tongue is long and cylindric, and is retractile into a sheath which opens in the anterior part of the floor of the mouth immediately in front of the glottis. Its free extremity is deeply bifurcate. It is the only tactile organ of the Serpentes.

The alimentary canal is elongate, and the stomach is a simple enlargement of its diameter, without transverse curvature. It passes gradually into the small intestine, which is more or less convoluted by short turns which adhere together and are inclosed in a common peritoneal fold, which does not follow the convolutions, as is the case in Sauria and other Vertebrata. The rectum is straight, of enlarged diameter, and of variable length. It is separated from the small intestine by a muscular constriction, which is passed at one side by a narrow communicating tube, which frequently leaves a rectal cæcum at one side. The walls of the stomach are often thickened, while those of the small intestine are variable, and are frequently densely papillose. The rectum presents a variety of internal structure. Its internal wall is smooth in *Eunectes murinus*, *Eryx thebaicus*, and *Cylindrophis rufa*. It has longitudinal plicas in *Ilysia scytale*, *Coluber obsoletus*, *Compsosoma corais*, *Zamenis flagellum*, *Natrix taxispilotus*, *Homalopsis leucobalia*, *Hydrophis striata*. With longitudinal folds there are transverse ones more or less developed in *Ophibolus polyzonus*, *Malpolon lacertinum*, *Dryophis prasina*, *Chersydrus granulatus*. There are free transverse folds more or less developed in *Leptognathus fasciata*, *Dipsas dendrophila*, *Oxybelis acuminata*, *Vipera ammodytes*, *Crotalus durissus*. The rectum is divided by transverse septa, with a perforation median or lateral, in *Python spilotis*, *Farancia abacura*, *Boodon geometricus*, *Elaps surinamensis*, *Bungarus* sp., *Ancistrodon contortrix*.

The salivary glands are labial or external to the maxillary and mandibular bones, and have numerous efferent ducts. In opisthoglyph snakes that portion of them which is opposite the posterior maxillary teeth is enlarged, and the secretion is discharged at the bases of the grooves of the teeth. In proteroglyph and solenoglyph snakes this gland is still further developed, and fills the space between the orbit and quadrate bones. Its efferent duct extends as a tube along the superior surface of the maxillary bone. In the genus *Causus* this gland is greatly elongate, extending posteriorly above the ribs for one-sixth the length of the animal (Reinhardt). In the Elapid genus *Adenitophis* the gland is restricted to a position corresponding to the posterior extremity of that of *Causus*, and has in consequence an efferent duct of extraordinary length (Meyer). In these types a portion of the tem-

poral muscle extends over the poison gland and compresses it when the mouth is opened. In the venomous groups the anterior glands are reduced. Besides the labial glands there is a gland anterior to the prefrontal region, between the maxillary and nasal bones. The liver is long and narrow, and is on the right side of the alimentary canal, and begins immediately posterior to the heart or at various distances posterior to it, according to the genus. Thus it is near the heart in species of robust form, as the *Viperidæ* and *Crotalidæ*, and in such genera as *Xenodon* and *Heterodon*. It is far removed in the *Tortricina*, *Epanodonta*, and *Catodonta*. It is exceptionally short in *Chersydrus*. Its distal extremity is bilobate, and the left lobe extends beyond the right. From between the two issues the cystic duct, which extends to and along the alimentary canal to the position of the gall bladder. This structure is remarkable in *Serpentes* for its distance from the liver. It is near to the spleen, which is adherent to the alimentary canal on its inferior side, and is of a subround form. The pancreas, which is of more elongate form but of relatively small size, is located near the spleen on the left side of the alimentary canal.

THE CIRCULATORY SYSTEM.

The disposition of the parts of the circulatory system in the *Serpentes* is dependent in large degree on the elongate form of these animals and on the arrangement of their respiratory organs.

Although the heart is situated cephalad of the posttracheal lung, its position is posterior to that which it occupies in the *Sauria*. In *Chersydrus* it is situated at about the middle of the length of the body, but in the *Natrices* it is at the anterior fifth of the length. It is of rather elongate form, and its chambers are compactly adherent, and it is inclosed in a tough pericardial sac. In adult snakes there is but one aorta root on each side, of which the left is the most robust. The common pulmonary trunk is distinct from the *truncus arteriosus* to the base. It was first observed by Schlemm¹ that in typical *Colubroidea* there is but one pulmonary artery, while in the *Peropoda* there are two. He also observed that where there is a tracheal lung there is an anterior pulmonary artery, as in *Vipera berus*, while in *Lachesis mutus* there are two. In *Thrasops flavigularis*, where the trachea is expanded transversely to the size of a tracheal lung, I have observed that there is an anterior pulmonary artery. There is generally a single carotid artery, which arises from the right aorta root. This may branch into two carotids, and in a few instances these carotids maintain their distinctness to the aorta root. The right aorta root also gives forth an anterior artery, the *arteria vertebralis* of Cuvier, which supplies the intercostal arteries. It extends along the right side of the vertebral column, or divides, each half running on one side of the column. The *cœliac* artery is divided into several. The mesenteric is represented by two trunks which leave the aorta at a considerable distance apart.

¹ Tiedemann and Treviranus' *Zeitschrift f. Physiologie*, II, 1827, p. 101.

The ophthalmic artery is divided from the facial, according to Rathke, excepting in the Peropoda and Angiostomata, where it rises from the *arteria cerebralis*. The latter is the primitive foetal connection in all snakes.

The cardinal veins are unimportant in the Serpentes, the posterior *vena cava* having taken their place. This vessel originates at the kidneys, being formed by the successive union of numerous *venæ renales revehentes*, and extends to the liver. It runs in a groove of the superior side of this organ, and receives *venæ hepaticæ* along its course, and then passing above the heart enters the *sinus venosus* on the right side of the right auricle. Authors differ in their accounts of the origin of the *vena cava*. Schlemm states that it is formed by the union of two branches, one from each kidney, while Stannius states that it is derived from the right kidney only. In an anaconda (*Eunectes murinus*) I traced it easily from the right kidney, but was not successful in following the left *renalis revehens* to a junction with the right, though I can not assert that none exists. I found the junction to be near the left testis in a *Coluber quadrivittatus*. The kidneys receive each a vein which corresponds to the *vena iliaca* of the Sauria, which are derived from a single *vena caudalis*. In *Chersydrus* there is a second large vessel running from the liver to the heart, which may be a *vena hepatica*.

The anterior caudal diaphragms of the Serpentes are bifurcate in a vertical plane. Between these branches are placed the lymphatics, which empty by a small vein into the *vena iliaca*. The thymus gland is a small elongate body lying near each carotid on each side, and near the heart. The thyroid gland is near the auricles of the heart on the middle line. Suprarenal bodies are present near the testis or ovaries, lying along the *venæ renales revehentes*.

THE RESPIRATORY SYSTEM.

This system includes the larynx, trachea, and lungs. The characters of the larynx in the various groups of snakes have not yet been worked out. A small tubercle may be observed at the anterior canthus of the glottis in many snakes. In two genera of Colubrinæ it is developed into a compressed vertical epiglottis, which by its rapid vibrations on the expulsion of air from the lungs produces a considerable noise (*Epiglottophis*, *Pityophis*). The trachea in the Serpentes is not divided into bronchial tubes, but where there are two lungs it is discontinued at the bifurcation, except in the case of the presence of a rudimental right lung. In this case the wall of the trachea is perforated by a foramen which communicates (rarely by a tube) directly with the rudimental lung. In such a case the tracheal cartilages may be continued for a long distance as a band on the left lung (genera *Halsophis*, *Pityophis*).

The lungs are sacs surrounded by a layer of reticulate bars or laminae of greater or less thickness. The bars are most robust at the anterior part of the lung, and become more attenuated and inclose

larger spaces toward the distal regions. In many species, especially the *Solenoglypha*, the distal part of the lung has very thin membranous walls. In *Chersydrus* the reticulate structure continues to the extremity, and the tracheal lung has no lumen. The left lung does not usually extend beyond the gall bladder, but in *Chersydrus* it extends to the anus. The post-tracheal or true lungs begin opposite the ventricle of the heart, or just posterior to it. The rudimental right lung, when present, is situated near the apex of the heart.

The condition of knowledge as to the character of the lungs of snakes was stated by Stannius, in 1856,¹ as follows:

The detailed accounts as to the single or double character of the lungs leave much to be desired. Among Ophidia Angiostomata there possess a single sac, *Rhinophis* and all Typhlopidae which have been examined; as to the Tortricidae [Ilysiidae], there are apparently species with two lungs (*T. xenopeltis*) [= *Xenopeltis unicolor*], and others with a single lung (*T. scytale*) [= *Ilysia scytale*]. Among Eurystomata, all the Peropoda (*Boa*, *Python*, *Eryx*) possess apparently two lungs. The Calamarina that have been investigated have one lung. Among Colubrina and Glyphodonta there are great variations. All the Coronellæ of Schlegel possess, according to Schlegel, a single lung. I find the lung single in *Rhachiodon scaber* [*Dasypeltis*]. *Tropidonotus natrix* [*Natrix vulgaris*] has a very small rudiment of a second lung. *Coluber* [*Spilotes*] *variabilis* possesses, according to Schlegel, the rudiment of a second lung. According to the statement of Meckel, this rudiment is common in *Coluber*. The Xenodons have, according to Schlegel, a single lung (*X. severus* and *X. rhabdocephalus*). In *Heterodon* I find a rudimental second lung. The Lycodons, according to Schlegel, possess a single lung; as also do *Psammophis* and *Homalopsis*. In *Dendrophis colubrina* Schlegel found the rudiment of the second lung. In *Dipsas*, according to Schlegel, there are variations; but he states that *D. multimaiculata*, *D. laevis*, and *D. annulata* [*Sidon annulatum*] have but one lung. The Achrochordina have but one lung. Among Hydrophidae I found in three species of *Hydrophis* the lung sac simple. Meckel states that *Platurus* has a very small rudiment of a second lung. Among the remaining poisonous snakes there is an insignificant rudiment of the second lung in the Elapina and Crotalina; while the Viperina possess an entirely simple lung.

In 1894 I presented to the American Philosophical Society² the results of my studies on this subject, in which I added many observations to those previously made, and discovered a number of important systematic indications. I also found occasion to correct some of the statements quoted by Stannius from Schlegel, as above noted. I give here the results presented in that paper:

The snakes with rudimental posterior limbs (Peropoda) show in the character of their lungs what they show in the rudimental limbs themselves, and in the hemipenis, the nearest relationships to the Lacertilia. They possess, with an exception to be noted later, two well-developed lungs, one of which is larger than the other. The smaller lung lies to the right side and ventrally, while the larger one lies to the left side and dorsally. In some species the dorsal and ventral relation is more pronounced than in others. In the Colubroidea the right or ventral lung is generally present, but of very much reduced proportions, the usual size being from 2-5 mm. in length. It is connected with the other lung by a foramen, which perforates the tracheal cartilage at a point a little beyond the apex of the heart, and opposite to

¹ Zootomie der Amphibien, p. 108.

² Proceedings Amer. Phil. Soc., XXXIII, 1894, p. 217.

the proximal part of the dorsal lung. It is sometimes connected to the dorsal lung by a short tube, in which cartilaginous half rings are seen in but two of the genera examined, viz, *Heterodon* and *Conopsis*. The lumen of the rudimental lung may be lined by the same reticulate structure as is seen in the dorsal lung, or its walls may be smooth. In some Colubroidea the rudimental lung is absent, but such species are relatively few.

The dorsal lung may present proximally alongside of the trachea an auricle or pocket, and this is so developed in the genus *Heterodon* as to reach to the head without communication with the trachea other than that furnished by the normal portion of the lung. In the Solenoglyphs, without exception, this extension of the dorsal lung is present, and extends to the head, and its lumen is continuous with the trachea throughout its length. The same structure exists in the genera *Hydrus* and *Hydrophis*, and also in the peropodous genus *Ungalia*, which differs besides from other Peropoda in having but one post-tracheal lung. Finally, the tracheal lung, as I have called it, is distinct from the true lung in *Platurus* and in *Chersydrus*. In the former of these genera the trachea is not separate from the lumen, while in *Chersydrus* it is distinct. It, however, communicates with the cells of which the lung consists in this genus by a series of regularly placed foramina on each side. There is no lumen in the tracheal lung in *Chersydrus*. In *Typhlops* we have a still further modification of the tracheal lung. It is without lumen, and is composed of coarse cells of different sizes. These have no communication with the trachea or lung that I can discover, nor any efferent orifice. It has occurred to me that this structure, which extends from the heart to the throat, may not be a pulmonary organ.

I have referred to the dorsal and ventral positions of the two lungs. The rudimental lung is to the right of the dorsal lung in the Colubroidea, but in the Ilysiidae it is to the left. It is quite questionable which lung this rudiment in this family really represents. In the Typhlopidæ the single lung is on the right side and extends from the heart to the liver. It has the position of the rudimental lung of the Colubroidea, and may represent it. I can not decide this question without further material. In *Glauconia* there is but one true lung, and this is ventral in position, and originates to the right of the heart, so that in this genus also it may represent the rudimental lung of the Colubroidea. There is here no tracheal lung or organ.¹

I now give a synopsis of the characters observed in the species examined.

CATODONTA.

Glauconia dulcis Baird and Girard. A single elongate right lung; no rudiment of left lung. No tracheal lung.

EPANODONTA.

Typhlops liberiensis Hallowell; *T. reticulatus* Linnæus. A right lung which is not elongate; no rudimental left lung. A cellular body surrounding the trachea, and extending from the heart to the throat, without lumen or connection with the trachea or lung.

The presence of the tracheal lung (?) and the freedom of the maxillary bone are points of resemblance to the Solenoglyphs!

TORTRICINA.

Ilysiidæ.

Two lungs, the ventral one to the left side of the middle line, rudimental, but lined with pulmonary tissue like the other lung, and less reduced than in the Colubroidea.

Cylindrophis maculata Linnæus. The right lung extends only to the liver.

Ilysia scytale Linnæus. The right lung is larger.

¹ See Peters, Reise nach Mozambique, III, p. 100, pl. xiv A, 1882.

Rhinophidæ.

Rhinophis oxyrhynchus Schneider. One large left lung and very small (3 mm.) right lung; no tracheal lung. Contrary to the statement of Stannius above quoted, as in Colubroidea generally.

ASINEA.

PEROPODA.

I. Two well-developed lungs of unequal size; no tracheal lung.

Pythonidæ.

Python regius Shaw; *P. molurus* Linnæus; *P. spilotes* Lacépède; *Loxocemus bicolor* Cope.

Boidæ.

Xiphosoma caninum Linnæus; *Epiplatys cenchria* Linnæus; *Chilabothrus inornatus* Reinhardt; *Boa constrictor* Linnæus; *Eunectes murinus* Linnæus; *Eryz johnti* Russell.

Charinidæ.

Besides the absence of coronoid and supraorbital and postorbital bones, this family differs from the Boidæ in the fusion of the nasal bones into a single plate. *Charina bottæ* Blainville.

II. One lung, without rudiment of a second; a tracheal lung extending from true lung, with which it is continuous, to throat.

Ungaliidæ.

Ungalia maculata Bibron; *U. melanura* Gray.

COLUBROIDEA.

I. Two well-developed but unequal functional lungs.

Xenopeltidæ.

Xenopeltis unicolor Reinwardt.

II. One functional lung only; the right rudimental lung sometimes possibly with limited function.

Colubridæ.

LYCODONTINÆ.

Lycodon aulicus Linnæus; *Boodon infernalis* Günther; *Urochis microlepidotus* Peters; *Stenorhina ventralis* Duméril and Bibron.

COLUBRINÆ.

Elapops modestus Günther;¹ *Coronella girundioa* Daudin; *Dinodon semicarinatus* Cope; *Ficimia olivacea* Gray; *Salvadora bairdii* Jan; *Pityophis sayi* Holbrook; *Epiplatophis pleurostictus* Duméril and Bibron; *Spilotes corais* Cuvier; *S. pullatus* Linnæus; *Coluber quadritineatus* Pallas; *C. obsoletus* Say; *C. quadrivittatus* Holbrook; *Zamenis constrictor* Linnæus; *Z. flagellum* Catesby; *Z. montovarium* Duméril and Bibron; *Z. atrovirens* Shaw; *Z. korros* Linnæus; *Cyclophis æstivus* Linnæus; *Drymobius pantherinus* Merrem; *D. boddærtii* Sentzen; *D. margaritifera* Schlegel; *Crossanthera melanotropis* Cope; *Herpetodryas carinatus* Linnæus; *Leptophis præstans* Cope; *L. mexicanus* Duméril and Bibron; *L. smaragdinus* Boie; *Dendrophis picta* Linnæus; *Dasypeltis palmarum* Leach.

DIPSADINÆ.

Dipsas blandingii Hallowell; *Himantodes gemmistratus* Cope; *Rhinobothryum lentiginosum* Scopoli; *Trimorphodon biscutatus* Duméril and Bibron; *Sibon septentrionalis* Kennicott; *Malpolon lacertinum* Wagler; *Clonophis kirtlandii* Hallowell; *Dryophis fulgida* Daudin; *Passerita mycterisans* Linnæus.

¹ Position uncertain; perhaps a Lycodontine.

CHRYSOPELEINÆ.

Chrysopelea ornata Shaw.

XENODONTINÆ.

Catostoma badium Duméril and Bibron; *Farancia abacura* Holbrook; *Abaster erythrogrammus* Daudin; *Ophiomorphus fuscus* Cope; *Helicops angulatus* Linnæus; *H. balogaster* Cope; *Dromicus parvifrons* Cope; *Halsophis leucomelas* Duméril and Bibron; *Xenodon rhadoccephalus* Wied; *X. angustirostris* Peters; *Lystrophis dorbignyi* Duméril and Bibron; *Heterodon nasicus* Baird and Girard; *H. platyrhinus* Latreille; *Hypsirhynchus ferax* Günther; *Uromacer oxyrhynchus* Duméril and Bibron; *U. catesbyi* Duméril and Bibron. Right lung larger in *Uromacer*.

SCYTALINÆ.

Hydrocalamus quinquovittatus Duméril and Bibron; *Erythrolamprus venustissimus* Linnæus; *E. flavidens* Günther; *Oxyrhopus plumbeus* Linnæus; *O. fitzingeri* Jan; *Conopsis pulcher* Cope; *C. sumichrasti* Cope; *Manolepis nasutus* Cope; *Ialtris dorsalis* Günther; *Philodryas viridissimus* Linnæus; *P. olfersii* Liechtenstein.

NATRICINÆ.

Generally a proximal auricle or pocket. *Eutania proxima* Say; *E. sirtalis* Linnæus, s. s., *sirtalis*, *obscura*, and *parietalis*; *Natrix fasciata* Linnæus; *N. rhombifera* Hallowell; *N. taxipilota* Holbrook.

Appendix to Colubridæ.

In the African *Thrasops flavigularis* Hallowell the right (rudimental) lung measures 5 mm. The trachea is enormously expanded transversely, simulating a tracheal lung, but its inferior wall contains the tracheal cartilages, which extend its entire width, and it contains no cells or trabeculæ. An artery with lateral branches extends its entire length, which is from the posttracheal lung to the throat. This character distinguishes this genus from *Leptophis*.

In the following species I found no trace of the right lung:

Colubrinæ. *Rhinocillus lecontei* Baird and Girard; *Cemophora coccinea* Blumenbach; *Osceola dolia* Linnæus; *O. getulus* Linnæus; *Pityophis melanoleucus* Daudin. Xenodontinæ. *Halsophis angulifer* Duméril and Bibron; *H. rudii* Cope.

Leptognathinæ. I propose this subfamily as distinct from the Xenodontinæ, on account of the presence of a large tracheal lung which is continuous with the normal lung, and with the trachea, and extends to the throat. *Leptognathus nebulatus* Linnæus; *L. garmani* Cope.

Scytalinæ. *Tachymenis strigatus* Günther; *Phalotris lemniscatus* Duméril and Bibron; *P. tricolor* Duméril and Bibron; *Erythrolamprus bipunctatus* Günther.

Natricinæ. *Cerberus boæformis*; *Pseudaspis cana* Linnæus.

Acrochordidæ.

Chersydrus granulatus Merrem. In this species the heart is at the middle of the length of the body, and the normal lung is posterior to it, extending nearly to the vent. No rudimental lung. A tracheal lung, composed of coarse cells and without lumen, extends from the heart to the head, and is discontinuous with the true lung. The trachea is closed, but communicates with the tracheal lung by a series of symmetrical pores on each side.

Najidæ.

One lung and a rudiment; no tracheal lung. *Pseudechis porphyriacus* Shaw; *Diemenia reticulata* Gray; *Naja tripudians* Linnæus; *Bungarus semifasciatus* Kuhl.

Elapidæ.

No rudimental nor tracheal lung. *Elaps lemniscatus* Linnæus; *E. fulvius* Linnæus; *E. corallinus* Linnæus; *E. multifasciatus* Jan.

Hydrophidæ.

I. One lung and no rudiment, continuous with tracheal lung, which extends to head.

Hydrophis hardwickii Gray (a slight constriction between tracheal and posttracheal lungs); *H. elliotii* Günther.; *Hydrus bicolor* Daudin.

II. A rudimental right lung connected with the left lung, which is separate from the large tracheal lung.

Platurus laticaudatus Linnæus.

SOLENOGLYPHA.

A tracheal lung, continuous with the normal lung.

Causidæ.

No rudimental lung.

Causus rhombeatus Lichtenstein.

Dendraspididæ.

No rudimental lung.

Dendraspis polylepis Günther.

Piperidæ.

No rudimental lung.

Clotho aristans Linnæus.

Crotalidæ.

I. No rudimental lung.

Bothrops lanceolatus Linnæus; *Ancistrodon piscivorus* Lacépède; *Sistrurus catenatus* Rafinesque; *Crotalus adamanteus* Beauvois; *C. confluentus* Say.

II. With a rudimental right lung.

Bothrops pictus Tschudi; *B. erythrus* Cantor; *Teleuraspis schlegelii* Berthold; *Ancistrodon contortrix* Linnæus; *Crotalus horridus* Linnæus.

The rudimental lung is often concealed from view and difficult to discover. The best test of its presence is the foramen which connects it with the trachea, which will generally be found piercing the cartilage of the latter near the apex of the heart. The rudimental organ may then be found by inserting a bristle, and observing its destination through the more or less transparent tissues. In but one instance have I found a rudimental lung without a connecting foramen, viz, in the Mexican *Vicinia olivacea*. On the other hand, the foramen may terminate in a small blind sac.

The pulmonary characters may be determined without much dissection. The position of the heart must be first ascertained, and a longitudinal median incision made in the abdominal wall. In all forms except the Epanodonta and Catodonta the trachea will be found passing to the left side of the heart and entering the lung near its apex. By splitting the trachea not too near its abdominal border, on turning the free margin upward as the snake lies on its back, the *foramen bronchiale* will be seen, and its lumen can be explored. The trachea is concealed by the œsophagus, which must be drawn to the left side of the body in order to make the examination. The examination of the tracheal lung requires the division of the abdominal wall further toward the head.

THE UROGENITAL SYSTEM.

The Serpentes possess no urinary bladder, but the ureters empty by separate orifices into the cloaca. The kidneys are unsymmetrically placed, that of the right side being anterior to that of the left. They are transversely lobate. The testes and ovaries are situated considerably anterior to the kidneys, and are similarly unsymmetrically placed, that of the right side being anterior to that of the left. The *vas deferens* is closely folded in its proximal portion, and runs along the external side of the kidney, where it is accompanied by the ureter. The two

ducts continue near or close together to the cloaca. The ovaries are within elongate folds of the peritoneum. The oviduct is near the edge of a deeper fold of the peritoneum on each side, and extends from near the cephalic extremity of the ovary to a common chamber or vagina, which is above the rectum, and opens into the cloaca. This vaginal chamber is large, and is divided more or less completely in the Solenoglyph snakes, is about half divided or deeply bilobate in the Colubroidea, and is undivided in the Peropoda. Its external wall is deeply longitudinally grooved, and the internal wall is transversely grooved in *Crotalus*. In Colubroidea generally it is deeply longitudinally grooved on all sides. In the Peropoda it is nearly or quite smooth. The cephalic extremity of the oviduct is for a short distance transversely plicate or lobate, the labia being held in place by simple unfolded bands of the inferior and superior edges. The fontanelle is immediately cephalad of this region, and has very thin simple walls. Being only a slit, it is sometimes difficult to discover. The oviducts do not accompany the ureters so closely as do the *vasa deferentia*, and approach nearer the middle line for a short distance below the rectum.

Like the Sauria the male Serpentes possess two intromittent organs or hemipenes. Each is a cylindric hollow body, which when not in use is retracted in a corresponding cavity on one side of the middle line of the tail. Into its posterior extremity is inserted a cylindrical muscle, which is continued posteriorly to a length generally greater than that of the hemipenis, to an origin on a caudal vertebra. When the hemipenis is in use it is protruded, and its inner surface is evaginated and becomes the external surface, the muscle just described occupying its center. It enters the vagina of the female and its extremity occupies the corresponding anterior lobe of the latter when present. It is withdrawn by the contraction of the central muscle or *retractor penis*. The hemipenis is generally armed with reverted or recurved spines. When this is the case the vaginal walls are very tough. When the hemipenis is unarmed the vaginal walls are thinner and smoother.

I have described the characters of the surface of the hemipenis in 1893,¹ and have shown that they furnish good indications of affinity and diversity among the snakes. The details then reported will be found under the head of classification. The general characters may be summarized as follows:

The hemipenis of the Serpentes is traversed by a groove which divides the external investment to the internal integument (or external integument when the organ is retracted), which begins at the base internally, and soon turns to the external side of the organ and continues to its extremity. This is the sulcus spermaticus. This sulcus is usually bifurcated in venomous snakes, and I find it to be equally bifur-

¹ American Naturalist, XXIII, p. 477; Transactions of the American Philosophical Society, XVIII, 1894, p. 186.

cated in many harmless snakes. The investing tissues may or may not correspond with this bifurcation. Thus the hemipenis may be more or less bifurcate. Schlegel states that it is bifurcate in venomous snakes, but it is not so in *Hydrophis hardwickii*, *Bungarus semifasciatus*, *Hoplocephalus coronatus*, etc., while it is bifurcate in many nonvenomous forms. Next to the bifurcation of the sulcus in importance, is the nature of the surface of the external investment (internal when retracted). In the most perfect types, both venomous and nonvenomous, this surface is reticulate like tripe, the inclosed areas forming calyces, which may have a suctorial function. Their borders are generally papillose, and are sometimes so deeply divided into papillæ as to lose their original character. These papillæ may be the seat of osseous deposit, becoming bristles or spines, which become larger toward the middle of the length, and lose their mutual membranous connections. These isolated spines may extend to the apex, but they rarely extend to the base. The surface may, however, be laminate and not reticulate, and the laminæ may be longitudinal or transverse. In either of these cases they may not be spiniferous. The apex or apices of the organ may be furnished with a rigid papilla or awn. The entire surface of the organ when protruded is designed for the maintainance of its position in the oviduct of the female, from which it can not be withdrawn excepting by invagination.

In the Tortricina and Peropoda the hemipenis is not spinous, and the sulcus is bifurcate, and in the Boidæ the hemipenis is bifurcate also, although in some genera (*Xiphosoma*, *Ungualia*) the branches are very short. The external integument is never reticulate, but is always laminate with elongate papillæ at the extremities, in *Epicrates*, *Xiphosoma*, and *Ungualia*. The laminæ are pinnate from the sulcus as an axis in *Morelia*, *Enygrus*, *Lichanura*, and *Eryx*, and are transverse in *Charina*. In *Ilysia* they are pinnate, with a few longitudinal plicæ below.

The principal variations in the Colubroidea are as follows:

No spines; surface longitudinally plicate; the surface of the hemipenis is flounced more or less transversely; the surface is more or less reticulate, and the sulcus spermaticus is undivided; hypapophyses anterior; the surface is reticulate or longitudinally plicate, and the sulcus is divided; hypapophyses anterior; the surface is neither reticulate nor flounced, and the spines when present are disconnected; hypapophyses continued to caudal vertebræ.

Similar gradations in the characters of the hemipenis are to be seen in the types of venomous snakes. Thus in the Proteroglypha this organ is spinous to the tip, on a calyculate basis, in *Hydrophis*, *Elaps* (*surinamensis*), *Dendraspis*. It is reticulate at the extremities and spinous below, in *Callophis* (*bivirgatus*), *Naja*, *Acanthophis*, *Bungarus*, and *Sepedon*; the apex smooth in the two genera last named. In *Elaps nigrocinctus* the organ is usually smooth, with a few spines at the apex.

In Solenoglypha the genus *Atractaspis* is spinous to the apex, apparently on a longitudinally laminate basis. In the Viperidæ and Crotalidæ the spines are on a founced basis. The apices are calyculate in *Bitis*, *Clotho*, and *Vipera*, and spinous in *Cerastes*. They are calyculate in Crotalidæ, in *Bothrops*, *Ancistrodon*, *Sistrurus*, *Crotalus*, and *Uropsophus*. In *Crotalus (durissus)* of the Neotropical fauna) the median spines are replaced by papillæ; in all the other genera they are spinous.

II. SYSTEMATIC CONSIDERATIONS.

Diversity of lung structure accompanies the primary groups which are characterized by peculiarities of the skeleton to such a degree that we are warranted in according it a high systematic value. Thus Angiostomatous and Peropodous snakes have two lungs, while the Colubroidea have one and a rudiment, and the Solenoglypha always have a tracheal lung. Exceptions and variations from these rules thus become of importance. Thus I have no doubt of the propriety of the separation of the Ungaliidæ from the other Peropoda, on account of its pulmonary characters. Nor is there any doubt in my mind of the necessity of the separation of the Leptognathinæ from the Xenodontinæ, on account of its large tracheal lung. The very marked characters of the genus *Chersydrus* characterize the family, as well as the osteological characters. It remains to be seen whether the family I termed the Nothopidæ, but which Boulenger unites with the Chersydridæ agrees with it in pulmonary characters. The remarkable tracheal lung or gland distinguishes the Epanodonta from the Cato-donta, emphasizing the differences observed in the osteology of the skull. The huge diverticulum of *Heterodon* serves to distinguish the genus from its allies. The extraordinary transverse dilatation of the trachea in *Thrasops* establishes the genus as distinct.

The value of the rudimental right lung as a character of the Colubroidea is increased by my investigations. In only two genera have I found it either present or absent, namely, *Halsophis* and *Pityophis*. I am not sure but that I may yet find it in the *P. melanoleucus*, where I have failed hitherto, but I am sure that it is present in some species of *Halsophis* and wanting in others. A natural group of American Colubrina, appears to be characterized by its absence, namely, *Rhinophilus*, *Cemophora*, and *Ophibolus*; all genera with an entire anal shield. The development of cartilages in the bronchial foramen or tube of the rudimental lung is not a constant character. I found it in one *Heterodon platyrhinus* and not in another; it is present in *Conophis pulcher*, but absent in *C. sumichrasti*.

The numerous characters presented by the hemipenis have various values. Several very distinct types are distinguishable, but they are continuous at some point, through intermediate forms. This is, however, the history of all characters which distinguish organic beings, especially of those which have been relied on as characters of the

minor divisions and genera of the Serpentes. The characters which I have discovered in the hemipenis have added greatly to our resources in the attempt to learn the relationships and hence origin of the members of the Serpentes.

In a broad way we may distinguish as leading types the following: The smooth; the plicate, or flounced; the calyculate, or ruched; and the disk-bearing. Any of these may have the sulcus spermaticus simple or bifurcate, and some of them may have the middle part of the organ spinous or not. The spines may extend to the apex so as to obliterate the pattern and the total organ may be bifurcate or not. As regards the indications of affinity presented by these types, it may be said that the nearer we approach the Sauria the less spinous is the organ, and the further away is the form the more certainly will the ruched structure prevail. The tendency to bifurcation is present in most groups, but it is universal in but one suborder, the Solenoglypha, or specialized venomous snakes.

In the Oriental region we have the smoothest type of Colubroidea, which includes the genera really allied to *Calamaria*, many of which have had hitherto widely different positions in the systems. Owing to the scarcity of specimens of this type in American museums, I have not been able to investigate them fully. The great Colubrine division is remarkably constant in its undivided sulcus and abundant calyces. In degenerate types the calyces become less numerous. The groove-toothed Dipsadines have the same structure. Except one Australian genus (*Acanthophis*) all the disciferous types are neotropical and all have a double sulcus. The other neotropical types with double sulcus may be calyculate or spinous and they present a great variety of detail. Here again the glyphodont and aglyphodont types are quite parallel to each other. The structure in the water snakes is again different and characteristic. The organ is feebly spinous from the base to or near to the apex, possessing no calyces, disk, or transverse plicæ, and the prehensile function is maintained by one or a few large hook-shaped spines at the base. In 1864 I referred several genera which had been placed in the Calamarinæ to the water snakes on account of the continuation of the hypapophyses to the tail. I was much gratified on examining their hemipenes to find that they (genera *Tropidoclonium*, *Virginia*, and *Haldea*) present exactly the characters of the group to which the vertebræ indicated that they should be referred. In like manner I have been able to refer genera supposed to belong to the Calamarinæ to almost every natural division of the Colubroidea by the study of the hemipenis. The old Calamarinæ of authors is simply an aggregation of burrowing or degraded forms of several natural groups.

The Natricine (water snake) group is connected with the groove-toothed water snakes (Homalopsinæ), and both of these groups pass probably into the Lycodontine series, the typical forms of which the

spines are arranged in frounces. It is difficult as yet, and perhaps may not become easy, to distinguish some members of the Lycodont group from certain ground snakes with totally spinous hemipenis, especially certain African genera, as *Elapops*, *Grayia*, and others. These questions remain for further research.

I have found the characters of the hemipenis as constant as those of any other part of the organism. Occasional irregularities are to be looked for, but the only one which I have met with is in the case of a specimen of *Boodon infernalis* from South Africa, in which the hemipenis is shortly bifurcate on one side and not so on the other. There is a tendency to bifurcation in some individuals of *Ophibolus getulus* which is not conspicuous in others, but this tendency does not appear in the sulcus. It is a tendency only. While certain characters of this organ, as already remarked, characterize series or groups of genera, others characterize the genera themselves. These are given in the analytical tables under the family and subfamily heads. On examining these tables it will be seen that the genera brought into close juxtaposition are frequently not most closely allied in general appearance. *The keys are only intended to present the penial characters; are not intended to display the serial or other relationships of the genera among themselves.*

I now give the exact definitions of the divisions as far as definable with present information. The definitions of the suborders are those of Müller, modified by myself.¹

A. Paroccipital intercalated in the cranial walls (*Angiostoma*).²

* No ectopterygoid; palatines bounding choanæ posteriorly; ethmoturbinal forming part of roof of mouth; rudiments of pelvis; two lungs. (Scoleco-phidia.)³

I. Maxillary bone fixed to prefrontal and premaxillary; a pubis.....CATODONTA.

II. Maxillary bone vertical and free from all others; no pubis.....EPANODONTA.

** An ectopterygoid; palatines not bounding choanæ posteriorly.

III. Maxillary bone free, horizontal.....TORTRICINA.

B. Paroccipital attached scale-like to cranial wall and produced freely; ectopterygoid present. (Eurystomata.)

IV. Maxillary bone horizontal, not forming a ginglymus with prefrontal.

COLUBROIDEA.

V. Maxillary bone vertical and articulating with the prefrontal by a ginglymus; a tracheal lung.....SOLENOGLYPHA.

In the following pages I present synoptical diagnoses of the genera of the Serpentes arranged in key form. These are placed under sub-

¹ Proc. Amer. Phil. Soc., 1886, p. 479.

² This arrangement was first published by the writer in the Proceedings of the Academy of Natural Sciences, Philadelphia, for 1864, p. 230. The definitions of the lower primary divisions were derived from J. Müller. It was published in greater detail, with the characters of all the families in the Proceedings of the American Philosophical Society, 1866, 479, and in the Bulletin of the U. S. National Museum, No. 32, 1887, p. 47.

³ The characters of this division as I originally gave them (Proc. Acad. Nat. Sci. Phila., 1864, p. 230) were derived from J. Müller, which have been shown to be partially erroneous by Duméril and Bibron, and Peters.

family heads, which are not, with the exception of the Homalopsinæ, defined. It is not certain, therefore, that their contents are in all cases properly limited or distributed. It remains a desideratum to discover the characters of the natural divisions of the Colubridæ, if any there be. The characters presented by Duméril and Bibron, and by Günther, are important but insufficient. For the definition of the genera distinct characters exist, although the subject is one of much difficulty. The object of definition being, as I imagine, precision, and the consequent increased facility of determination, I have employed all structural characters whatever, and only neglected them where it is evident that they are inconstant within the limits of a species. I find of the greatest importance the grooved or nongrooved characters of the posterior teeth, and the absence or number of the scale pits. The division or nondivision of the anal scutum is also of much importance, although in a very few genera (for example *Xenodon*) it is not constant. Relying, as the system always must, on exact characters, I have not allowed considerations of "physiognomy" to change a result where it conflicts with structure, which is, however, rarely the case. The tendency of some authors to neglect characters and to depend on "physiognomy" destroys precision and explains nothing, besides rendering identification of species most laborious, resting as it must in that case on purely empirical methods. I also do not use as generic characters the number of rows of scales, or of labial scuta, believing that these are only available in the distinction of species.

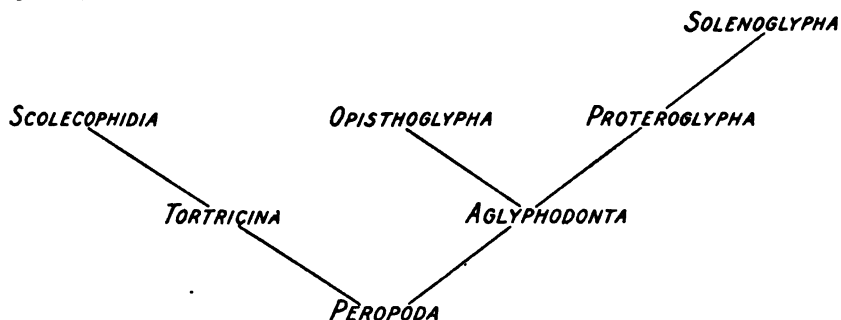
In a few instances I have not been able to examine the skeletons of genera of doubtful position, so that their reference to a family division may yet have to be altered. I have, however, studied the fine series in the museums of Paris and Washington, besides a considerable number in my own collection. For the characters of many genera which I have not seen I have had to rely on the descriptions of others, especially those of the recently issued second edition of the Catalogue of Snakes, in the British Museum, by Boulenger.

III. PHYLOGENY.

The earliest snakes known to paleontologists have been found in the Upper Cretaceous beds of Europe and North America, those of the former region being a little the older. Some of these are allied to the Boas, while others are said by Sauvage to display characters of the Epanodonta. But few specimens are known, and these are vertebræ, so that their characters remain uncertain. Marsh has described some ophidian vertebræ from the Laramie beds of the Rocky Mountain region. I have described the genus *Helagras* from rather numerous vertebræ from the Puerco bed of New Mexico. An interesting peculiarity of this genus is the imperfection of the zygantrum in some vertebræ and the robustness of the neural spine. Next in time are the Palæophids, vertebræ of which Owen first discovered in the English

Eocene, and I subsequently obtained from the marine Eocene of New Jersey. These snakes were of large size, and display points of resemblance to the Boidæ. Venomous snakes first appear in the Upper Miocene. Viperidæ were found by Lartet in France, and I have found Crotalidæ in the corresponding (Loup Fork) bed in Kansas. The evidence from paleontology, then, is, so far, that the Peropoda appeared earlier in time and the Solenoglypha later. This is in accordance with their systematic relations. However, we have little to base an actual phylogeny upon, from the paleontological evidence at present, and we can only draw inferences from structural characters in their relation to other groups of reptiles, and especially to the other orders of the Squamata.

It is probable that the Peropoda are the earliest and ancestral form of the Serpentes, since they display characters in both the skeleton, penial structure and viscera, which approach the Sauria. The Scolecophidia are allied to them, but can not be regarded as ancestral, but rather as degenerate descendants, being connected with them by the intervening group of the Tortricina. On the other hand, the ascending series may be traced through the Colubroidea to the Solenoglypha. Among the Colubroidea we may regard the Aglyphodonta as nearest the Peropoda and the Opisthoglypha and Proteroglypha as side branches. The latter lead to the Solenoglypha. We know of no direct transitions between Opisthoglypha and Proteroglypha, but the genera *Ogmodon* Peters and *Glyphodon* Günther, which have numerous grooved teeth, furnished an ancestral type from which both could have been derived. The *Platyserpens*, some of which Boulenger shows have grooved teeth behind the fangs, may have been derived from the same source. This phylogeny may be schematically represented as follows:



This diagram is closely similar to one published by Boulenger, with whose conclusions I entirely agree.¹

Degeneracy has played an important part in the history of the Ser-

¹ I had already stated the same conclusions in general in 1885 in the *American Naturalist*. See *Origin of the Fittest*, 1887, p. 334.

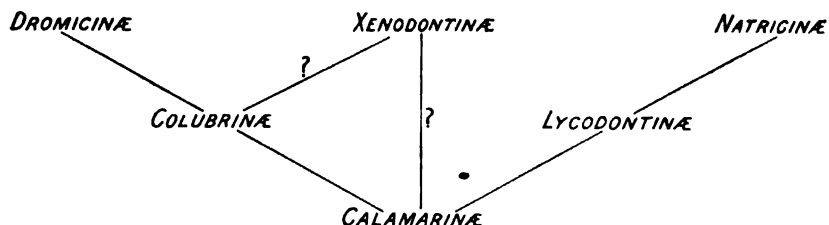
pentes, although they form as a whole an ascending line. The line of the Tortricina and Scolecophidia is such, as already remarked, and these are approached by the ground Peropoda, as *Eryx*, *Charina*, etc. Nearly every division of the ascending line exhibits degenerate side branches, and mostly of a similar type. Thus in the Opisthoglypha we have the small burrowing type of *Tantilla* and similar forms in America, and in Africa *Aparallactus* and others. Of Proteroglypha, *Elaps* shows a tendency in the same direction, and in *Vermicella* (Australia) it is more pronounced. The same thing is observable in most of the divisions of the Aglyphodonta. The Old World Calamarinae, which approach nearest the Peropoda, present many such types. In the Aglyphodont series the acquisition of the calyculate structure of the hemipenis with spines is evidence of advanced type, the flounced character being inferior and directly affiliated with the Calamarian and Peropodan. We have in the Colubrinae examples of degenerate types (mostly in Central America), where the calyces become reduced in number and the proportion of spines increased in connection with degeneracy in other respects. The same degeneracy in primal structure may take place when the flounces become obsolete and spines only are left. It is possible that the Natricine group acquired its primal character in this way, without having passed through a calyculate stage. This group also has its specially degenerate forms in America, as *Storeria*, *Virginia*, and *Haldea*.

Among the Solenoglypha we have a conspicuous example of degeneracy in the African genus *Atractaspis*, which, like the other examples above cited, is a burrower in its habits. In external appearance it considerably resembles the Opisthoglyph genus *Aparallactus*, of the same region. Degeneracy of the hemipenis by loss of calyces and extension of spines is seen in the genera *Cerastes* and *Echis*.

The degeneracy so far referred to consists in the reduction of the mechanism of rapid movement, the contraction of the mouth parts, the reduction of the eyes, and the shortening of the tail. All of these consequences have probably resulted from the adoption of a more or less subterranean life, or "earth-parasitism," as I have termed it, as they certainly are associated in life. Another kind of degeneracy, which is less common, is the attenuation of bones surrounding the mouth and the reduction in number and size of the teeth, conditions associated with the use of soft food, as caterpillars, etc. This is exhibited by the family of the Amblycephalidae, which live in the forests of the Indian and neotropical regions. Accompanying the reduction of the jaws is an abbreviation of the muzzle, which, with the large eye, gives a very foetal character to the head.

Having thus cleared the main lines of degenerate complications, we could trace the ascending series of the Aglyphodonta, had we the material. This is unfortunately insufficient. That the Natricinae are a distinct line is attested by their continued vertebral hypapophyses,

as well as by the penial structure. Probably the following scheme expresses the history:



In this table the Lycodontinæ are not regarded as characterized by elongate anterior teeth as is usually done. Some of the genera are truly so characterized, as *Lycodon* and others, but they are off the main line. As to the Xenodontinæ it is impossible to determine whether they are derived from Calamarinæ (which are not now found in the same region with them) or whether they have come off the Colubrinæ by loss of calyces and development of apical disc.

IV. HISTORY.

Linnaeus did not correctly distinguish the suborder Serpentes, but placed its species in a heterogenous assemblage,¹ along with the snake-like lizards and the batrachian Cœciliidæ. Laurenti, in 1768,² followed him, changing the name to Serpentina.

The name Ophidia was proposed by Brongniart in 1799,³ but the definition of this order, as he esteemed it, was not improved. In the system of Oppel (1811)⁴ we find the Ophidia (which he spelled Ophidii), purged of all extraneous forms excepting the Amphisbænia. Under the name Serpentina, Merrem, in 1820, adopted the group as left by Oppel. Wagler⁵ finally reduced the division to its proper contents in 1830 and retained for it the name Serpentes. As this was the first publication in which the suborder, was properly limited, the name given must be retained. Duméril defined the group correctly, employing the Brongniartian name Ophidia. In this he has been followed by most later authors, including Gray, Stannius, Owen, and Huxley.

As regards the contents of the suborder Serpentes, the first classification of a thorough character was that of J. Müller, who in 1831,⁶ divided the Serpentes into two divisions, the Microstomata (= Angiostomata) and Macrostomata (= Eurystomata), basing them on the proportions and position of the paroccipital bone or suspensorium of the quadrate; separating the Peropoda on account of the rudiments of pelvis. The next classification was that of Duméril, who with Bibron

¹Systema Naturæ, 10th ed., 1758, p. 196.

²Specimen Synopsin Reptilium, Vienna, 1768.

³Bulletin, Academy of Sciences, Nos. 35, 36, 1800.

⁴Ordnungen, Familien u. Gattungen der Reptilien, Munich.

⁵Natürliches Syst. der Amphibien, München.

⁶Tiedemann and Treviranus, Zeitschrift f. Physiologie, IV, p. 190.

investigated especially the dental structures and divided the order into Opoterodonta, Aglyphodonta, Opisthoglypha, Proteroglypha, and Solenoglypha. The first is Angiostomatous and the last four are Eurystomatous. In the system of Stannius¹ we have other than dental characters considered. Thus the Angiostomata are divided into Typhlopina and Tortricina, and the Eurystomata into Peropoda, Asinea, and Thanatophidia, the last including all of the venomous snakes. In 1845 Gray, in his catalogue of snakes in the British Museum, had combined forms with grooved posterior teeth and the colubriform venomous snakes with the harmless snakes under the name Colubroidea, and this arrangement was continued by Günther in his catalogue of the Colubrine snakes of the British Museum in 1862. The author of the present work adopted a system which included the merits of those already in existence, adopting the divisions of Müller and Stannius with those of Duméril, placing the Opisthoglypha with the true Colubroidea like Gray, but adopting for the entire group Stannius's name, Asinea. I also rearranged some of the venomous genera in accordance with their cranial structure, which had been overlooked by previous authors. Finally, in the system of Boulenger, as adopted in the Catalogue of Snakes in the British Museum, the Opisthoglypha and Proteroglypha of Duméril are included in the Colubriform superfamily, as was done by Gray and Günther. This division, Colubroidea, was then divided into Aglypha, Glyphodonta, and Proteroglypha.

The classification of the great mass of the Colubroid snakes has always been a difficult problem. Duméril relied on the relative proportions of the teeth, and established numerous "families" based upon them. These divisions are often not natural, while others are entirely tenable. On the whole, however, the larger divisions, based on proportionate lengths and apart from the grooving for conveying saliva, lack definition, owing to the insensible gradations which they present. The characters adduced by Duméril are, however, of general application in the definition of genera. Their application has been extended by Boulenger, but to a degree of refinement which is in some cases not practicable, owing to gradations. Hence it became important to discover other characters. This I have done in those exhibited by the male intromittent organ and by the pulmonary structure. The former furnish many characters which express affinity or the reverse, and re-enforce or modify those which we have hitherto possessed.

V. HABITS.

The peculiar form of the snakes among vertebrate animals, their comparative abundance, and the fact that some of them are especially dangerous to life, invests them with more popular interest than any other group of reptiles.

The characteristics of the venomous forms will be pointed out in the

¹ *Zootomie der Amphibien*, 1856.

following pages. Meanwhile I will refer to the fact that while the general facies of the typical venomous snakes (Solenoglypha) is easily recognized by the eye, the characters of the frequently no less dangerous Proteroglypha are not so easily distinguished from those of the harmless ones. They are only to be distinguished by an especial knowledge of species or by an examination of the dentition. In the Columbian fauna we have but one genus which presents this determinate appearance, *Elaps*, but in the warm regions of the Old World such genera abound, and in Australia there is no other type of venomous snakes.

In the Solenoglypha the bite is effected by two movements. The first is the spring of the body, and the second is the grasp by the maxillary bones, which work freely by a ginglymus on the prefrontal bones. The bite as exhibited by a lizard or a mammal, by the closing of the lower jaw on the upper, is of little effect in the Solenoglypha, if it occurs at all, while the movement of the maxillary bones is very conspicuous. I was once nearly bitten by the nearly severed head of a *Crotalus molossus*, nothing but a piece of skin connecting it with the body, as I was exhibiting the large fangs. A *Sistrurus catenatus edwardsii*, which I held by the neck on one occasion, opened and closed its fang bearing maxillaries energetically. This may be observed also in other Crotalids when about to bite and unable to reach their enemy. It is quite the reverse with the Proteroglypha. Authors agree that the *Elaps* closes the lower jaw, holding its prey in its mouth and piercing it repeatedly with the fangs. The movement of the maxillary, so conspicuous in the Crotalidæ, is impossible to these serpents.

The question as to whether the Opisthoglyph serpents are venomous in any degree has been recently discussed. A synopsis of what is known on this subject has been recently published by Dr. L. Stejneger,¹ of the U. S. National Museum, and from it I make the following extracts:

It seems that the Dutch professor, Reinwardt, while in Java, was the first to discover that certain snakes, dreaded by the inhabitants of that island as venomous, are provided with long grooved fangs at the posterior end of the maxillary bone. He communicated this discovery to Dr. H. Boie, in Leyden, who published it in 1826.² The suspicion expressed by Professor Reinwardt that this channel or groove on the anterior side of these fangs might convey the fluid from a poison gland led to several important investigations, the first of which to be published was Dr. Hermann Schlegel's memoir on the salivary glands of the serpents with grooved teeth.³

He came to the conclusion that inasmuch as he found the structure of their glands to be similar to that of other salivary glands, there could be no doubt that they secrete "a fluid similar to the ordinary saliva;" and as "recent observations of travelers" served to show that the bites of snakes with grooved teeth produce no fatal results to man, he asserted with characteristic positiveness that it is "erroneous" to class with venomous serpents those snakes which have the posterior teeth long and channeled. However, a short time after, Prof. G. L. Duvernoy, of Strassburg, pub-

¹The Poisonous Snakes of North America, Report of U. S. National Museum for 1893, 1895, p. 337.

²Oken's Isis, 1826, p. 213.

³Nova Acta Acad. Leop. Nat. Curios., Bonn, XIV, 1828 (pp. 145-154).

lished a no less important treatise on the subject.¹ He pointed to the yellow portion of the supramaxillary gland as being structurally different from the white portion, and from its being connected with a large grooved fang by a single duct he concluded, with equal assurance, that we have here before us a venom apparatus only in degree differing from that of the snakes with poison fangs fixed to the anterior end of the maxillary bone. His results were accepted and introduced into the classification adopted in the monumental herpetological work of Duméril and Bibron, the *Erpétologie Générale*, in which the snakes with grooved posterior fangs were placed in a separate group as "*Opistoglyphs*." On the other hand, Schlegel, paying no attention whatever to Duvernoy, in his *Physiognomie des Serpentes*, maintained his standpoint, and so great was the authority of the learned Leyden professor that his view was until quite recently accepted by some of the most prominent systematists. It seems that neither side ever attempted to end the dispute by direct experiments, and gradually the *Opistoglyphs* to many herpetologists ceased even to be "suspected."

About ten years ago the interest in this question was suddenly revived, and as it may now be fairly regarded as a burning one, some space will be devoted to a short review of several of the recent investigations into this theme.

Two Italian students, M. G. Peracca and C. Deregibus, were led to make special investigations into the possible venomous nature of *Malpolon lacertina* (= *Calopeltis insignitus*), a snake common about Nizza and in parts of Italy. In a communication to the Academy of Medicine at Turin, in May, 1883,² after first describing the grooved fangs, the glands, and the duct leading to the fangs, they recounted their experiences with the snake in question.

Their experiments were carried out with two specimens of *Calopeltis* (= *Malpolon*), one of medium size, the other much larger; the victims consisted of lizards, frogs, and toads. The snake did not bite them voluntarily; it was necessary to open its mouth and to force the animal into its throat; whereupon the snake inoculated the venom, the motion of the bone carrying the poison fangs being very distinctly seen on account of the manner in which they were standing out from the posterior part of the head. The act of biting lasted some moments, and the snake repeated this act several times without allowing its prey to escape.

The animals were bitten in the hind limb; in the case of the frog the skin had to be removed from the part to be bitten, as the irritating secretion of the skin appeared to be particularly distasteful to the snake. Without reciting the various experiments in detail, the authors state the more apparent phenomena accompanying them to be (1) the suspension of the respiration, which in the main occurs in a very few minutes (thirteen minutes being the maximum in a toad) and may happen suddenly, or may be preceded by a gradual sinking, interrupted by a deep breathing pause; (2) the cessation of reflex movements in the bitten limb, while still persisting for some time in the rest of the body; the excitements applied below the bitten point ceased almost immediately to be transmitted to the medulla and to show reflexes. This alteration maintained itself local for some time, afterwards progressing toward the periphery along the nerves of the wounded limb. The general paralysis does not delay long in coming. It is but rarely accompanied by convulsions. The heart continues to beat for a long while (in the toad), but its strength decreases gradually. The blood revealed nothing notable under the spectroscope; as a matter of course it had become venous at the suspension of the respiration. The rapid changes which were observed at the wounded point are noteworthy; the muscular tissue became livid and inexcitable. Death ensued generally in half an hour, or less; in a toad it took place in twenty-six minutes. The heart of a frog continued to beat for many hours after. The authors then call attention to the interesting similarity between the above symptoms and those accompanying the poisoning by

¹Ann. Sci. Nat., XXVI, 1832, pp. 144-156; XXX, 1833, pp. 6-26.

²Giornale della R. Accademia di Medicina di Torino (3), XXXI, 1883, pp. 379-383.

the cobra de capello, and finally state that they have made controlling experiments with innocuous snakes which did not have such effect upon the animals bitten.

In a subsequent résumé of this article¹ the same authors add that the effects of the bite of the *Malpolon* are not to be feared by man. "It seems," they say, "that the bite is only dangerous to reptiles, birds, and small mammals (mice); young dogs have resisted the poison rather well."

Similar investigations and experiments were carried out about the same time, or a little earlier (1882), on an American species in Guanajuato, Mexico, by Prof. A. Dugès, who has published his notes concerning *Trimorphodon biscutatus*,² a snake belonging to a genus representatives of which have been found along our southern border. He gives figures of his dissections, showing the venomous gland, with its duct supplying the grooved posterior fangs with the poison. He records his experience as follows:

"One day I was admiring the snake. I saw him seize a *Cnemidophorus sexlineatus* [the striped swift, a lizard] at the middle of the body, advancing its jaws so as to bring the corner of the mouth in contact with the body of the lizard; for several moments it *chewed* (a rare occurrence in a snake) its victim without the latter moving, letting go after having killed it; but at this juncture the saurian was swallowed by another snake (*Ophibolus doliiatus*) which was kept in the same cage, thus preventing me from finishing the observation. A few days after, the same *Trimorphodon* caught another *Cnemidophorus* by the left arm and *chewed it several times*. At the end of a few minutes the bitten animal died without convulsions, without agitation, as if asleep, a little blood issuing from the wound."

A little later (1885), Mr. Otto Edmund Eiffe³ published some observations, also made in 1882, on *Turbophis vivax*, an opisthoglyph snake inhabiting the countries bordering on the Eastern Mediterranean, and from his account we quote as follows:

"I offered the half-grown snake a perfectly healthy *Lacerta vivipara*, which he at once commenced to lap with his tongue and then grasped slowly behind the forelegs. The lizard defended itself as best it could and used its teeth well on the enemy. In less than a minute the lizard was almost motionless, the jaws were powerless, and the eyes closed; before the expiration of another half minute the lizard died, and was then swallowed."

Prof. Léon Vaillant, of the Museum of Natural History, at Paris, observed the poisonous effect of the bite of another of the opisthoglyph snakes, *Tragops prasinus*, Wagler, and gives the following interesting account of one of the observations:⁴

"A small living green lizard was presented to the snake by means of a forceps. The snake seized it across the neck without descending from the shrubbery among which it used to live, and by the play of the jaws drew it back to the corner of the mouth. The lizard tossed and bent about, winding its body and tail round the head of the snake; three minutes later it hangs down inert, only the tail still trembling; after a similar space of time convulsions of the whole body occur again, twining itself around the head, then relapsing without motion, except some spasmodic undulations of the tail; this lasts for two minutes, and the animal is dead. It will be seen that this poison must have been tolerably active, as it caused the death of the lizard in about eight minutes after the puncture by the fangs, which must have taken place when the lizard reached the angle of the mouth, as the snake made no movement after that."

It seems quite plain from these observations that we have here to do with a specific poison. The victims succumbed within a very short time, and while it is evident that death was not caused by the mechanical injury inflicted by the bite, much less by the shock, there is as little room for assuming that it was due to the action of bacteria-infected ordinary saliva.

¹ Archives Italiennes de Biologie, V, 1884, pp. 108, 109.

² La Naturaleza (Mexico), VI, 1884, pp. 145-148.

³ Zool. Garten, 1885, p. 45.

⁴ Mém. Centen. Soc. Philom., 1888, Sci. Nat., p. 44.

These experiments have again aroused the interest in the morphology and physiology of these glands, and two years ago, sixty years after Duvernoy's work, Mr. F. Niemann published¹ some investigations upon this subject. Among other snakes he dissected and described two species with posterior grooved fangs, and he clearly demonstrates that, in both, the yellowish gland has already passed the innocuous stage and become a true poison gland, though structurally somewhat intermediate—as are, in fact, the fangs. He found in both species the yellowish gland well circumscribed and clearly differentiated from the true supralabial gland, although both glands are contained in the same envelope of connective tissue, and he was able to trace the single duct leading from the yellowish gland to the groove of the posterior elongated fang. One of the species was *Tragops prasinus*, Wagler (the same species with which Professor Vaillant experimented), and an inhabitant of the East Indies, the other being *Sibon annulatum* (Linnaeus), from tropical America. Fig. 1 is a copy of Mr. Niemann's schematic representation of the arrangement in the former. Fig. 2 shows a section of the grooved fang near its base, copied from the same author.

That these snakes are not entirely harmless, even to man, is evident from the very recent experience of Mr. J. J. Quelch, of Georgetown, British Guiana,² who was bitten on the first finger by a large specimen of the common red-white-and-black-banded snake, *Erythrolamprus rufus*, driving its hinder grooved teeth three times down into the flesh. About half an hour after, the finger became much swollen at the place and distinctly very painful. It was not till about four hours afterward that real relief was obtained, though the place was tender for a much longer time. Another case was that of the clerk in the Museum, who was bitten on the finger by a young specimen of the common frog snake, or Mattipi, *Xenodon severus*, whose hinder enlarged teeth were driven deeply into the flesh, with a result similar to that described in the case of the other snake.

It will be observed that while the snake by which Mr. Quelch himself was bitten is a true opisthophagus with grooved posterior fangs, the one which caused a similar result in the clerk, viz, the *Xenodon*, has the enlarged posterior teeth solid and not grooved. I would call attention to the fact, however, that this identical species is described by Duvernoy³ as having the yellowish gland well differentiated. That the bite of the allied species, *Xenodon rhabdocephalus*, did apparently have no unpleasant effect on Dr. Stradling⁴ is not difficult of explanation in view of the fact that occasionally the bite of some of even the most dangerous snakes has been ineffective; but enough is said to show that the question is not an unreasonable one: Is it essential for a truly venomous snake to possess grooved fangs?

As a matter of fact, at the very moment of this sentence going to press, the question seems answered conclusively in the negative by the experiments of Phisalix and Bertrand, who have shown that the saliva of even ordinary solid-toothed harmless snakes contains the same specific poison which characterizes the dreaded *Thanatophidia*.

But four genera of Opisthophaga enter the political boundaries of the United States, namely, *Sibon*, *Trimorphodon*, *Coniophanes*, and *Tantilla*. Of these only the second and fourth can be properly reckoned to the Columbian Fauna.

Snakes are popularly believed to possess a power of "charming" or attracting to themselves other animals, especially birds, against their will, so that they easily capture them for food. This belief rests on a habit which is usual among the smaller birds, of annoying other ani-

¹ Archiv f. Naturgeschichte, LVIII, Pt. 1, 1892, pp. 262-286, pl. xiv.

² Zoologist (3), XVII, January, 1893, pp. 30, 31.

³ Ann. Sci. Nat., XXX, 1833, pp. 14, 15.

⁴ Referred to in Miss C. C. Hopley's "Snakes, etc.," 1882, p. 400.

mals which they dislike or fear. Everyone knows how they will congregate about an owl who has not sufficiently concealed itself by daylight, and will make their hostility known by cries and efforts to strike their enemy. So I have witnessed a crowd of birds collected about a black snake, which displayed their hostility by many cries and movements, the snake the while eying them with an inactive interest. Should one of the birds venture too near, I strongly suspect that the snake would take advantage of the opportunity to secure a meal, but this I have not witnessed. I believe, however, that the stories of "charming" are due to an observation of this not uncommon experience of the field naturalist.

Snakes are for the most part carnivorous; a few forms, as, for example, the genus *Herpeton*, are more or less herbivorous. They are most effective restrainers of the undue increase of the small Mammalia, and, in the case of the smaller snakes, of the increase of insects, by the destruction of the larvæ, as well as of the imagines. They are the assured friends of the agriculturist, and as such should be permitted to live and increase. This may be safely done in North America, where there is really but one species of venomous snake not easily distinguished, the *Elaps fulvius*, and that is confined to the Gulf border and a small part of that of the southern Atlantic. Some of the large Colubrine snakes, for example, of the genus *Compsosoma*, are permitted to live in and about the houses of the natives in some parts of South America, and in some localities of western North America the large and harmless Pityophides perform the same function. All of our species of Colubroidea, however, are of utility to man and should be permitted to live, not only on this account, but also on account of the beauty of their forms and often coloration.

In discussing the breeding habits of certain snakes Prof. O. P. Hay¹ makes the following remarks:

Notwithstanding the deep impression which serpents have made on the human mind, as shown in literature and in popular conversation, it is astonishing how little accurate information has been accumulated concerning some of their habits. The densest ignorance, the result of inattention and general lack of interest, prevails with regard to some of the most interesting matters connected with the life history of snakes; while, on the other hand, many of the popular notions about the powers of these animals are either wholly false or are gross exaggerations of the truth. The breeding habits of our snakes, even of the most common species, belong among the things about which little is known. Even our biologists have given but little attention to this subject, while unscientific people simply recognize the fact that nests of snakes' eggs are occasionally met with. For instance, who would not suppose that all the essential facts are known concerning the reproduction of the common black racer *Bascantion constrictor*? Nevertheless, where have we been told when it lays its eggs, how many there are of them, how they are concealed, and when they hatch?

Some snakes are known to lay eggs which after a period produce young. Other snakes are known to retain the eggs within the body until the young have attained sufficient size and strength to care for themselves after birth. Still other species are supposed sometimes to lay eggs, at other times to bring forth living young,²

¹Proc. Indiana Acad. Sci. for 1891, p. 106.

²Proc. Amer. Assoc. Adv. Sci., 1873, p. 185.

or to produce some eggs and some living young at the same time.¹ There are, indeed, oviparous snakes and snakes which are ovoviviparous, and there is a conspicuous difference in their eggs. The eggs of the oviparous species are furnished with a thick, tough, flexible covering or "shell," while the eggs of the species which produce living young have coverings which are very thin and delicate. Now, should such eggs as the latter be laid any considerable period before the young are ready to be excluded, the thin envelopes would surely be torn during the writhings of the embryo. That some of the eggs may be partially developed at the time when the embryos of other eggs are ready to be ushered into the world, and that all may be expelled together, is possible; but this is not the normal course of things and may not be well for the immature young. Normally the coverings of such eggs are ruptured before birth or immediately afterwards. On the other hand, it is quite probable that the eggs of the oviparous species are laid a considerable period before they are hatched. The tough coverings of such eggs protect them from attacks and injuries from without and at the same time resist the movements of the young snake within. So far as we know these eggs are deposited in the earth in piles of decaying vegetable matter and similar places.

A very curious structure deserves mention here. This is the "egg-tooth," a small tooth fixed to the united premaxillary bones and projecting forward slightly beyond the edge of the upper lip. It is present only in the embryo and is shed shortly after the escape of the young snake from the egg. In the ovoviviparous species, the tooth may apparently be shed before the young are born. The tooth is employed by the little snake in ripping open the tough egg covering in its efforts to escape from its prison. It would appear to be of little service to the young, which are mature when born, since the egg coverings are so very tender; nevertheless I have found the tooth present in all of the ovoviviparous species whose young I have had opportunity to study. This tooth, as found in the black racer, was described as long ago as 1857 by Dr. Weinland,² but Müller had observed it even earlier.

The habits of particular species of snakes are referred to under the respective heads.

EPANODONTA.

TYPHLOPIDÆ.

I. Muzzle covered above by rostral and internasal scuta.

α. Two ocular plates and a preocular.

One nasal plate *Letheobia* Cope.

αα. One ocular and a preocular.

One nasal plate *Typhlops* Schneider.

Two nasal plates *Helminthophis*³ Peters.

ααα. One ocular and no preocular.

One nasal plate *Typhlina*⁴ Wagler.

Two nasal plates *Liotyphlops*⁵ Peters.

II. Muzzle and front with five symmetrical scuta.

Two nasals and a preocular *Anomalepis* Jan.

No species of the Typhlopidae has been found in the Nearctic realm. They occur in all tropical regions.

¹ Proc. Acad. Nat. Sci. Phila., 1887, p. 121.

² Proc. Essex Inst., II, 1856, p. 28, pl. 1.

³ *Idiotyphlops* Jan.

⁴ *Pilidion* Duméril and Bibron. *Typhlinalis* Gray.

⁵ *Rhinotyphlops* Peters.

CATODONTA.

GLAUCONIIDÆ.

Glauconiidæ BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 57.

GLAUCONIA Gray.

Glauconia GRAY, Cat. Liz. Brit. Mus., 1845, p. 139.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 59.

Stenostoma WAGLER, Nat. Syst. Amphib., 1830; not of Latreille, 1810 (Coleoptera).

Rena BAIRD and GIRARD, Cat. Rept. N. Amer., Pt. 1, Serpents, 1853, p. 142.—COPE, Proc. Amer. Phil. Soc., 1886, p. 481.

Catodon DUMÉRIl and BIBRON, Erp. Gén., VI, 1844, p. 318; not of Artedi.

Siagonodon PETERS, Gesellsch. Naturforsch. Freunde, Berlin, 1881, p. 71.

Leptotyphlops STEJNEGER, Proc. U. S. Nat. Mus., 1891, p. 501 (after Fitzinger; *nomen nudum*).

Head slightly depressed and continuous with the body. Snout blunt and rounded, overlapping considerably the lower jaw. A large rostral plate. One or two nasals. One ocular shield, which extends to the labial border. Medial row of scales extending over the head to the rostral. Nostrils lateral, oblong, situated between the nasals. Eyes covered by continuous epidermis.

This genus is found throughout tropical Africa and America, and it embraces a considerable number of species in all the faunal regions of the latter. These are of subterranean habits, which are little known. Some of them are said to inhabit ants' nests. One species is known from India.

Three species are known from our fauna. They differ as follows:

α. Supraorbital scales present.

Two superior labials in front of the ocular; postocular bounded by three scales posteriorly; colors pale *G. dissecta* Cope.

One superior labial in front of ocular; postocular bounded posteriorly by two scales; colors pale *G. dulcis* Baird and Girard.

αα. Supraorbital scales absent.

One superior labial in front of ocular; parietals not divided; brown.

G. humilis Baird and Girard.

GLAUCONIA DISSECTA Cope.

Glauconia dissecta COPE, Amer. Naturalist, 1896, p. 753.

Stenostoma dulce COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 11; not of Baird and Girard.

Nasal entirely divided; rostral rounded behind, reaching the line of the eyes. Two labials anterior to the ocular, the posterior reaching the eye. Frontal and supraorbital scales smaller than those posterior to them. The eye is close to the nasal, and distant from the supraocular. Postocular reaching last labial, and bounded posteriorly by three sub-equal scales. Inferior labials five, the second twice as large as any of the others; the fourth barely reaching the commissure of the mouth,

and the fifth very small. Scales in fourteen rows. A large preanal plate. Tail flattened below, entering total length about eighteen times.

Color very light brown above, whitish below.

Measurements.—Total length, 23.5 mm; tail, 12 mm.

I found the specimen above described in a road at the silver mines at Lake Valley, in southern New Mexico.

The appearance of this species is so similar to that of the *G. dulcis* that I originally identified it with the latter. It is, however, very dif-

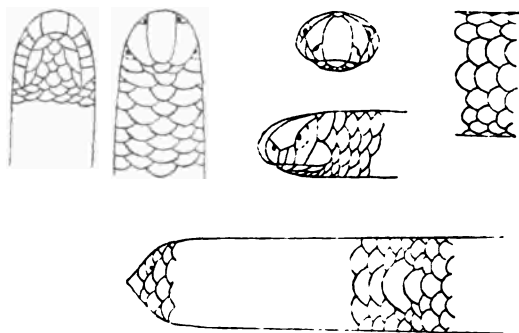


Fig. 142.

GLAUCONIA DISSECTA COPE.

× 3.

Lake Valley, New Mexico.

Collection of E. D. Cope.

ferent, especially in the number of labials, and the scales which adjoin the postocular posteriorly. There is no plate comparable to the so-called parietal of the *S. dulcis*.

GLAUCONIA DULCIS Baird and Girard.

Glauconia dulcis BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 65.

Rena dulcis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 142.

Stenostoma dulce PETERS, Monatsber., Berlin Akad., Wiss., 1857, p. 402.—COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 305.—JAN, Icon., Gen. Ophid., Pt. 2, fig. 5

Stenostoma rubellum GARMAN, Memoirs Mus. Comp. Zoology, Cambridge, VIII, 1883, p. 130; according to Stejneger.

Reddish brown above; reddish white beneath. Fourteen rows of scales. Body depressed. Eye shield separated by a small supraocular from the series representing the frontal.

Body slender, elongated, rather stouter posteriorly than anteriorly, depressed, broader than deep. Tail very short, subconical, bluntly terminated, about one-twentieth of the total length. Rostral rounded, tapering, separating the nasals for nearly their whole length. Nasals proportionally large, entirely separated by the nasal suture, tapering upward, and undulating. Inferior nasal subtriangular, nostril situated on the middle of its upper margin, close to the frontonasal. Eye shield large, irregularly oblong, extending to the top of the head from the

margin of the jaw. Postocular and parietal similar, transversally elongated, the parietal somewhat larger. Four shield-shaped scales in a longitudinal series between the parietals, postoculars, eye shield, nasals on each side, and the rostral in front, occupy the place of the vertical.

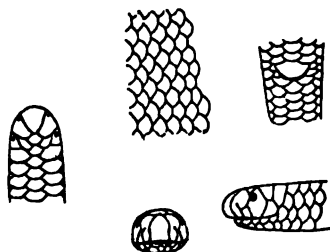


Fig. 143.

GLAUCONIA DULCIS BAIRD AND GIRARD.

× 2.

Type.

Western Texas.

Cat. No. 7290, U.S.N.M.

On the crown, and just above the eye shield, is a small semilunar plate, separating it from the series just described, the homologue of the supraorbital. The margin of the upper jaw is formed in front by the rostral; on the sides next to the rostral by the nasal, behind which is a subquadrangular, obliquely elevated labial, limited above by the fronto-nasal, and posteriorly by the eye shield, which enters likewise in the upper labial series. Posterior to the eye shield is a subtriangular labial at the angle of the jaw, approximating above the postocular, and limited behind by the parietal

and the beginning of the scales. Inferior labials five, similar to the scales under the throat.

The scales present a great uniformity throughout the whole length of the body; a little smaller beneath than above.

This species ranges from central Texas to the Red River on the east and southward along the Rio Grande in Texas as far as San Antonio.

Glaucania dulcis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
7296	1	Between San Pedro and Comanche, Texas.	Col. J. D. Graham, U. S. A. . .	Alcoholic type.
4872	1	Monterey, Nuevo Leon	Lieutenant Couch, U. S. A. . .	Alcoholic.
8177	1	(?)	do.	do.
10728	1	Texas	George B. Sennett	do.
7291	1	Near Monterey, Nuevo Leon	do.	do.
13620	2	Texas	I. H. Garner	do.
15534	1	Cook County, Texas	G. H. Ragsdale	do.
20965	1	Texas	Dr. F. E. Daniels	do.
22381	1	Mesilla Valley, New Mexico.	T. D. A. Cokerell	
22385-6	1	San Antonio, Texas.	H. H. and C. S. Brimley	

I have this species also from Erath County, Texas (Jacob Boll), the most eastern locality known to me.

GLAUCONIA HUMILIS Baird and Girard.

Glauconia humilis BOULENGER, Cat. Snakes, Brit. Mus., I, 1893, p. 70.

Rena humilis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, I, 1853, p. 143.

Stenostoma humile COPE, Check-list N. Amer. Batr. Rept., 1875, p. 44; Proc. Acad. Nat. Sci. Phila., 1861, p. 305.—PETERS, Monatsberichte Akad. Wiss. Berlin.

Siagonodon dugèsi BOCOURT, Miss. Sci. Mex., Rept., 1882, p. 507, pl. xxix, fig. 9.

Rena humilis STEJNEGER, Proc. U. S. Nat. Mus., XIV, 1891, p. 501.

Body very slender and cylindrical. Scales in 14 rows. The eye shield in contact with the longitudinal series on top of the head. Tail short, conical, tapering, not acute, one-fifteenth of the total length. Head less depressed. Eyes and nostril more distinct than in the preceding species. No supraorbitals. Postparietals much smaller than the parietals. Scales on the abdomen larger than on the back. Uniform chestnut brown, lighter beneath.

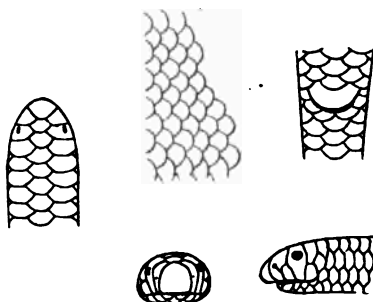


Fig. 144.

GLAUCONIA HUMILIS BAIRD AND GIRARD.

× 2.

Cape St. Lucas, Lower California.

Cat. No. 5292, U.S.N.M.

Glauconia humilis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2101	1	Valleita, California		Dr. J. L. LeConte.....	Alcoholic type.
5292	2	Cape St. Lucas, L. California.		J. Xantus	Alcoholic.
12601	1	La Paz, L. California.....	Feb. —, 1882	L. Belding.....	do.
15943	1	Fort Yuma, Arizona		U. S. Fish Commission ..	do.
16952	1	Tucson, Arizona		Herbert Brown.....	

I have this species from Batopilas, Chihuahua, and Dr. Dugès records it from near Guanajuato.

TORTRICINA.

In *Ilysia* the hemipenis is deeply bifurcate, and the surface of each branch is flounced. The flounces are oblique to the sulcus, and are spineless. Below the bifurcation the surface is smooth, excepting a wart.

ILYSIIDÆ.

Intermaxillary bone dentate; eye covered by a single scute.....*Ilysia* Hemprich.
Intermaxillary edentulous; eye surrounded by distinct scales.. *Cylindrophis* Wagler.

No species of this family has been found in the Nearctic realm.

RHINOPHIDÆ.

I. Tail terminating in a large shield.

Rostral plate produced posteriorly, separating the nasals... *Rhinophis* Hemprich.Rostral not produced; nasals in contact *Uropeltis* Cuvier.

II. Tail scaly to end.

 α Eye in the ocular shield.Tail terminating in a disk of keeled scales; sup. orbitals and postocular confluent..... *Silybura* Günther.Tail compressed, truncated, terminating in a bicuspid scale, the points superposed; postocular distinct..... *Plectrurus* Duméril and Bibron.Tail with smooth scales, terminating in one or two points; postocular united with superciliary; a median chin groove..... *Melanophidium* Günther. $\alpha \alpha$ Eye between the surrounding shields.Tail tapering, terminal scute ending in a horizontal ridge; no chin groove..... *Platyplectrurus* Günther.Tail tapering, ending in a single point; no chin groove... *Teretrurus* Beddome.

No species of the Rhinophidæ has been discovered out of the Palæo-tropic realm.

COLUBROIDEA.

Five well-marked divisions are embraced in this suborder, as follows:

I. Chevron bones with distinct hæmapophyses.

Rudimental posterior limbs; no grooved teeth; generally two lungs... PEROPODA

No rudimental limbs or grooved teeth; one lung rudimental.... AGLYPHODONTA

No rudimental limbs; a posterior maxillary tooth or teeth, grooved; one lung rudimental GLYPHODONTA

No rudimental limbs; an anterior tooth with a tube for poison duct; one lung rudimental PROTEROGLYPHA.

II. Chevron bones complete, forming hæmal spines.

No rudimental limbs; a tubular tooth in front of mouth; one principal normal lung and a tracheal lung PLATYCERCA.

It is questionable whether the Aglyphodonta and Glyphodonta should be retained as distinct from each other. Most of the penial characters found in the one occur in the other, and it remains to ascertain whether these, or the grooving or not of the teeth, are to be considered to be of primary importance. For the present I follow the example of Duméril and Bibron, and Boulenger.

PEROPODA.

I find here three distinct families, as follows:

Two pulmonary lungs, no tracheal lung; nasal bones distinct; a coronoid bone; hemipenis plicate..... BOIDÆ.

Two pulmonary lungs; no tracheal lung; nasal bones coossified; no coronoid bone; hemipenis plicate..... CHARINIDÆ.

One pulmonary lung; a tracheal lung; two nasal and a coronoid bone; penis smooth UNGALIIDÆ.¹

¹ Cope, Proc. Amer. Phil. Soc., 1894, p. 220.

BOIDÆ.

Within this family the characters of the hemipenis vary considerably. The plicæ are more or less undulate, and in some genera they fuse at intervals, producing pockets which sometimes approach the character of calyces. The sulcus, and generally the entire organ, is bifurcate. The plicæ may also be represented at the apex by distinct papillæ. The genera which I have examined present the following characters;

I. Sulcus double.

α. Hemipenis single.

Plicate and not papillose *Eryx* Daudin.¹

αα. Hemipenis furcate entirely plicate. *Boa* Linnaeus.² *Eunectes* Wagler.³

More or less pocketed { *Lichanura* Cope.⁴
Python Daudin.⁵
Enygrus Wagler.⁶

Apex papillose *Epicrates* Wagler.⁷

II. Sulcus single.

Apex papillose *Chilabothrus* *Duméril and Bibron.

The sulcus in the *Chilabothrus striata* examined is divided for a short distance, when the branches reunite.

Several forms of this family I have not been able to examine, as *Chondropython*, *Saurinia*, *Bolieria*, etc. I therefore give now a synopsis of the genera based on the other known characters.

1. Supraorbital bones present (Pythoninæ).

I. Premaxillary teeth present.

α. Fossæ in labial plates of both jaws.

Scuta on end of muzzle only *Morelia* Gray.

Scuta extending to between orbits *Python* Daudin.

Scuta covering vertex and muzzle *Liasts* Gray.⁹

αα. Fossæ in inferior labials only.

Muzzle shielded to frontal region *Nardoa* Gray.

ααα. No labial fossæ.

Head shielded; tail prehensile *Aspidiotes* Krefft.

Head with nine regular shields above; rostrals plate protuberant; tail not prehensile *Lorocemus* Cope.

II. No premaxillary teeth.¹⁰

Labial plates with fossæ; vertex and front squamous; nostril in one nasal; scales smooth *Chondropython* Meyer.

Head covered with large scuta *Aspidopython* Meyer.

2. Supraorbital bones absent. (*Boina*.)

I. Tail prehensile.

α. Scales smooth.

β. Labial fossæ present.

Plates on muzzle only *Xiphosoma* Wagler.¹¹

Plates extending over muzzle and front *Epicrates* Wagler.¹²

¹ *E. jaculus*.² *E. marinus*.³ *P. (Morelia) argus*.⁴ *E. angulifera*.⁵ *Corallus* and *Chrysenis* Gray.⁶ *Corallus* and *Chrysenis* Gray.⁷ *B. constrictor*.⁸ *L. trivirgata*.⁹ *E. carinatus*.¹⁰ *C. striatus*.¹¹ *Epicarsius* Fischer.¹² *Epicarsius* Fischer.

ββ. No labial fossæ.Muzzle and front scaled; nasal plates meeting *Lichanura* Cope.

Muzzle and front scaled; nasal plates widely separated

Boa Linnaeus.¹Muzzle and front scutate; nares vertical *Eunectes* Wagler.Muzzle and front with scuta divided on the median line; nares lateral *Chilabothrus* Duméril and Bibron.²

Muzzle and front with median scuta; nares lateral

Ungaliophis Meyer.*αα.* Scales carinate.

Top of head with symmetrical plates; nares in a single plate

Bolieria Gray.³Plates on muzzle only *Casarea* Gray.⁴

Top of head scaly; rostral plate forming border of mouth

Enygrus Wagler.

Top of head scaly; labial plates meeting below rostral plate

Trachyboa Peters.

II. Tail not prehensile.

α. Palatine teeth well developed.*β.* Rudiments of hind limbs visible.A mental groove *Gonglyophis* Wagler.No mental groove *Eryx* Daudin.⁵*ββ.* No visible rudiments of hind limbs.Scales keeled; head very distinct. *Erebophis* Günther.*αα.* Palatine teeth none (Peters).Scales smooth; top of head with symmetrical plates to between orbits; one nasal *Calabaria* Gray.⁶

The species of the Pythoninæ are restricted to the Palæotropical, Ethiopian, and Australian realms except those of the single genus *Loricemus* Cope, which inhabit Mexico and Central America, within the Neotropic realm.

The only genus of Boinæ which is known to enter the boundaries of the Nearctic realm is *Lichanura*. It is possible that the *Boa imperator* has been seen in the valley of the Lower Rio Grande, but of this positive evidence is as yet wanting. This species and *Epicrates angulifera* of Cuba, and also species of *Ungalia* are occasionally introduced into the country in bunches of bananas. The serpent winds itself tightly around the stem, and is concealed from view until the fruit is being removed. Unless of large size, these snakes are harmless.

LICHANURA Cope.

Lichanura COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 304; Bull. U. S. Nat. Mus., No. 32, 1887, p. 50.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 129.

General form abbreviated and stout; tail short, slightly prehensile, obtuse at the extremity. Head slightly distinct; eye small, pupil ver-

¹ *Acrantophis* Jan.² Includes *Homalochilus* Fischer; *Pelophilus* Duméril and Bibron (= *Sanzinia* Gray); *Dendrophilus* Jan, and *Piesigaster* Seoane.³ *Platygaster* Duméril and Bibron.⁴ *Leptoboa* Duméril and Bibron.⁵ *Cusoria* Gray.⁶ *Rhoptrura* Peters; may belong to the Charinidæ.

tical. Nostril between two plates, the anterior in contact with that of the opposite side upon the median line. Frontonasal suture extensive. Posterior to these, the upper surface of the head is covered with smooth scales. Labial plates without pits. Scales smooth, broad, poreless. Spurs conspicuous. Gastrosteges narrow.

In this genus the tail is less prehensile than in *Boa*, but is more so than in *Eryx* and *Charina*. It also differs externally from the latter genus (with which Garman at one time proposed to unite it) in the absence of the frontal plate and the parietals adjacent to it. An important osteological difference is the presence of the coronoid bone, which is wanting in *Charina*.

The species of this genus are variable in their details both as to squamation and coloration. I distinguish three species. Dr. Stejneger has named another, which he subsequently withdrew. In his latest study of this genus this author distinguishes the species as follows:

A. Eye large; its diameter more than one-third distance from anterior canthus to tip of muzzle; gastrosteges about 218.

Whitish with three blackish brown longitudinal bands in strong contrast.

L. trivirgata.

AA. Eye smaller; its diameter one-third or less the distance from anterior canthus to tip of muzzle; gastrosteges 224 to 241.

Color brownish or bluish above, with or without longitudinal bands, which when present contrast but little with the ground color; true loreals 3; scale rows 39-43; rostral not prominent *L. roseofusca*.

Color as above; true loreals 2; scale rows 35; rostral prominent *L. orcutti*.

LICHANURA TRIVIRGATA Cope.

Lichanura trivirgata COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 304.—BOCOURT, Miss. Sci. de Mex., p. 513.—STEJNEGER, Proc. U. S. Nat. Mus., 1889, XII, p. 98.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 129.

Lichanura myriolepis COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 2.—STEJNEGER, Proc. U. S. Nat. Mus., 1889, p. 96.

Lichanura simplex STEJNEGER, Proc. U. S. Nat. Mus., XII, 1889, p. 98.

Scales of the body in forty to forty-five longitudinal rows, the inferior a little larger than the others. Eight to ten scales in the ocular ring; superior labials fourteen or fifteen, the anterior three highest. Loreals, three superior vertical, two inferior horizontal. Rostral plates slightly prominent, elevated, recurved, quinquelateral, its labial border as long as its nasal. Inferior labials fifteen, the anterior five longest. A short mental fissure.

General color pale yellowish, tinged with brown. The belly and flanks are irregularly specked with liver brown. Superiorly there extend from the muzzle to the end of the tail three deep liver brown bands, the median four and the two lateral, five scales wide, separated by intervals three and a half scales in width.

The coloration of this handsome boa is altogether unique in the family. It calls to mind the *Salvadora* of the same region. It inhabits the southern region of Lower California, where Mr. J. Xantus has

obtained it for the Smithsonian Institution (Cat. Nos. 2277, 2287). He found it in swamps among the mountains.

Cat. No. 12602; rows of scales 40; superior labials, 14; gastrosteges 215 + 1; urosteges, 44; total length, 582 mm.; tail, 96 mm.

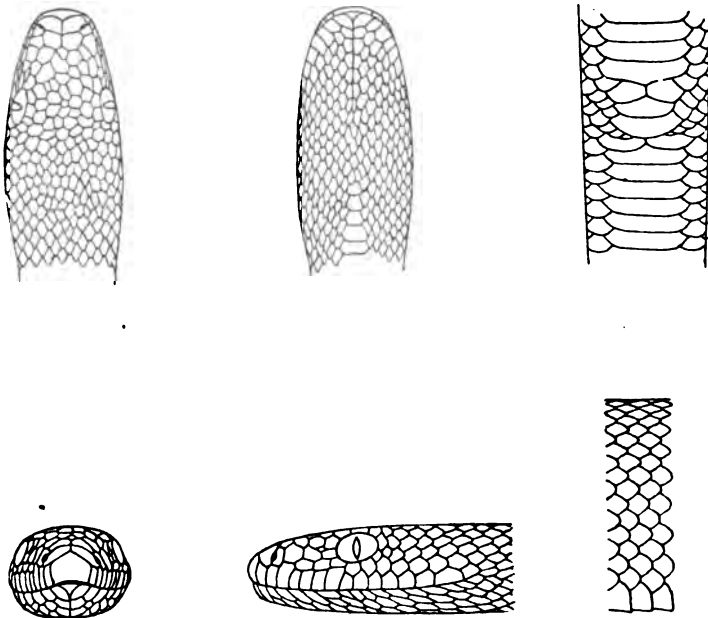


Fig. 145.

LICHANURA TRIVIRGATA COPE.

× 1.5.

Cape St. Lucas, Lower California.

Lichanura trivirgata Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimens.
5023	2	Cape St. Lucas, Lower California.	.....	John Xantus	Alcoholic type.
12602	1	La Paz, Lower California.	Feb. —, 1882...	L. Belding	do.

***LICHANURA ROSEOFUSCA* Cope.**

Lichanura roseofusca COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 2.—STEJNEGER, Proc. U. S. Nat. Mus., 1889, p. 98.

Lichanura roseofusca COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 2.

Lichanura simplex STEJNEGER, Proc. U. S. Nat. Mus., XII, 1889, p. 97, fig. 2.

This species is represented by a specimen (Cat. No. 14129) from San Diego, California. The color above, as far as the fifth row of scales on each side, is a brownish lead color; below this line and on the lower surface, light lead-color with dark lead-colored borders to some of the scales, and a wide lead-colored basal shade of the gastrosteges and urosteges. There are three longitudinal rusty-brown bands on the dorsal region, which are indistinctly defined and of irregular width.

Cat. No. 14129; rows of scales, 42; superior labials, 14; gastrosteges, 229; urosteges, 49; total length, 788 mm.; tail, 115 mm.

It was on a specimen of this variety from the same locality that I proposed the species *Lichanura myriolepis*. It has forty-five rows of scales. Another specimen from San Diego is described by Dr. Stejneger as a distinct species under the name of *L. simplex*. It has forty rows of scales, and there are no longitudinal stripes above, the general color above being "brownish drab," below, whitish; gastrosteges, 232; uros-

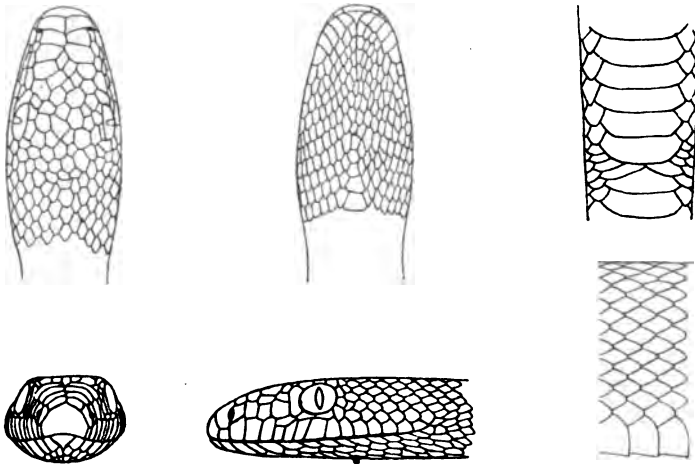


Fig. 146.

LICHANURA ROSEOFUSCA COPE.

× 1.5.

Lower California.

W. M. Gabb.

teges, 39. Eye encircled by seven to eight scales. These forms graduate into the *L. trivirgata* both in color and in number of scale rows. The number of gastrosteges is larger, but I suspect that this character also is not constant.

The typical specimen was brought by Mr. William M. Gabb, from the region of the boundary between Upper and Lower California, but the exact locality has not been preserved. The Smithsonian specimens are as follows:

Lichanura roseofusca Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
15503	1	Colorado Desert, San Diego County, California.	C. R. Orcutt.	Alcoholic.
14129	1	do	do	do.
13810	1	San Diego, California.	Rosa Smith	Type of <i>L. simplex</i> .
16327	1	do	C. R. Orcutt.	Alcoholic.
16850	1	do	do	do.
20643	1	Harqua Halla Mountains, Arizona.	Herbert Brown	do.
20383	1	Witch Creek, San Diego County, California.	H. W. Henshaw.	do.
20953	1	Harqua Halla Mountains, Arizona.	Herbert Brown	do.
22574	1	do	C. R. Orcutt.	do.

LICHANURA ORCUTTI Stejneger.

Lichanura orcutti STEJNEGER, Proc. U. S. Nat. Mus., XII, 1889, p. 96, fig. 1; 1891, p. 513.—COPE, Proc. Acad. Nat. Sci. Phila., 1892, p. 592.

Dr. Stejneger thus describes this species, which is the form most distinct from the *L. trivirgata*:

Scales in thirty-three to thirty-five rows; eye encircled by nine or ten scales; loreals four; labials thirteen to fifteen; gastrosteges, two hundred and thirty-two; anal entire; urosteges forty-five, entire.

Rostral plate very prominent, recurved, pentagonal, its nasal border twice as long as its labial; eye surrounded by a ring of scales of nearly equal size, ten on the right side, but only nine on the left; between the posterior nasal and the middle preocular two large loreal scales, and under the posterior one, wedged in between it, the middle and lower prefrontals, and fourth, fifth, and sixth supralabials, a somewhat smaller subloreal; over the posterior loreal a superloreal of medium size; nasal divided, the anterior plate meeting the one of the other side; back of these a pair of rather large anterior prefrontals followed by four smaller posterior prefrontals, or what corresponds to these plates where a frontal exists, the outer ones being larger than those in the middle; posterior to these the head is covered with numerous rather irregular scales; supralabials thirteen, the first four highest; infralabials fifteen, gradually diminishing in height from the pair joining the triangular mental; mental fissure separating four pairs of scales; scales of body smooth, in thirty-three to thirty-five longitudinal rows, the inferior on each side slightly larger than the rest; gastrosteges narrow, two hundred and thirty-two; anal small, entire; tail short, blunt; urosteges forty-five, entire.



Fig. 147.

LICHANURA ORCUTTI STEJNEGER.

=1.

Dimensions.—Total length, 870 mm.; length of tail from anus, 110 mm.; diameter of eye, 3 mm.; from tip of muzzle to anterior border of eye, 11 mm.; proportion of last two measurements = 1:3.7.

Coloration.—Ground color light bluish gray, with a light brownish wash on the upper surface; three longitudinal ill-defined, zigzag bands of a pale raw umber brown running the whole length of the body, the middle one starting between the eyes running to the end of the tail, the lateral ones starting on the temporal region becoming obscure on the tail; top of muzzle and occasional blotches between the bands of the same color; whole underside, except the gulars, mottled irregularly with blotches of a dark neutral tint.

Of the forms which compose this genus the present species appears to be the most highly differentiated, the most distinctive feature being the elongation of the snout and the prominence and shape of the rostral. From the *L. trivirgata*, *myriolepis*, and *simplex* group, it differs more particularly by the low number of scale rows and loreals.

Lichanura orcutti Stejneger.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
1	San Diego, California	C. R. Orcutt	Alcoholic.

CHARINIDÆ.

In *Charina* the sulcus of the hemipenis is bifurcate, but the organ is simple. The surface is plicate, the plicæ distant toward the apex, and the apex smooth.

But one genus of this family is known.

CHARINA Gray.

- Charina* GRAY, Cat. Snakes Brit. Mus., 1849, p. 113.—COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 51.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 130.
Wenona BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 139.—BOCOURT, Miss. Sci. Mexique, 1882, p. 511.

Nostril between postnasal and prenasal, the latter confluent with the internasal. Two pairs of prefrontals; a frontal and rudimentary parietals. Pupil vertical. Scales of body smooth. Tail short, obtuse; not prehensile. Anal spines exerted.

Prenasal separated from internasal; postnasal joining preocular; prefrontal entering orbit; one superciliary; superior labials 8-9.....*C. brachyops*.
 Postnasal plate separated from preocular; prefrontal not entering orbit; more than one superciliary; prenasal fused with internasal; superior labials 9-11...*C. bottæ*.

CHARINA BRACHYOPS Cope.

- Charina brachyops* COPE, Proc. U. S. Nat. Mus., 1888, p. 88, pl. XXXVI, fig. 2.—STEJNEGER, Proc. U. S. Nat. Mus., XIII, 1890, p. 181.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 131.

Muzzle rather elongate; extremity depressed, rostral plate reflected backward above, but not separating internasals. These are about equal in dimensions to each of the two pairs of the prefrontals, and like them are not separated from each other by scales on the median line. The frontal would be a semicircle were it not that the anterior border presents a very obtuse angle forward. This border is continuous with the anterior border of the superciliary, which is not the case in the *C. bottæ*. The posterior prefrontal passes in front of the single superciliary, and its postero-external border occupies more of the border of the orbit than does the preocular below it. The parietal is a semicircular band, and it is followed immediately by the usual type of scales. The anterior prefrontals rest at their extremities equally on the preocular and the postnasal. The former is trapezoidal, and is about as high as long; the latter is a little longer than high. The prenasal is very small. Superior labials eight on one side and nine on the other; the eye resting on the third, fourth, and fifth on one side, and on the same plus the sixth on the other. Two postoculars. Three or four pairs of geneials of about the same size as the gular scales. Scales of the body in forty-five rows. Tail short obtuse, with a dermal cap-scale.

Color in alcohol: dark brown above, light brown or yellowish below.

Number of specimens.	Locality.	From whom received.	Nature of specimens.
1	Point Reyes, California.....	U. S. Fish Commission	Alcoholic.

The single small specimen described above stands quite outside the wide range of variation of the *C. bottæ*, presenting characters which might be and have been considered to be of generic importance. The separation of the prenasal, and absence of the loreal plates can not, however, be so used in this group in my opinion.

CHARINA BOTTÆ Blainville.

Charina bottæ GRAY, Cat. Snakes Brit. Mus., 1849, p. 113.—COPE, Check-list N.

Am. Batr. Rept., 1875, p. 43.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 130.

Tortrix bottæ BLAINVILLE, Nouv. Ann. Mus. Hist. Nat., Paris, III, 1834, p. 57.

Wenona plumbea et isabella BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, pp. 139, 140.

Head short; crown flat; muzzle prominent, blunt, rounded, depressed; frontals four transverse, band-like, hinder rather larger; frontal wider

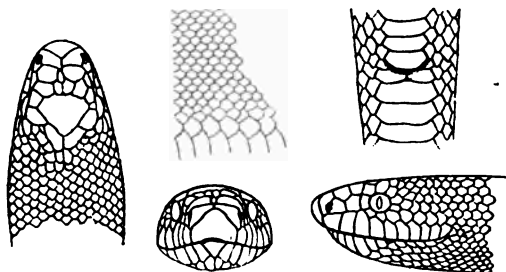


Fig. 148.

CHARINA BOTTÆ BLAINVILLE.

× 5.

Cat. No. 8952, U.S.N.M.

than long; angulate behind, large; parietal very small, oblique; in contact with parietal; one or no loreal, one anterior larger and three posterior smaller oculars; superciliaries three or two; small; rostral large convex depressed, produced posteriorly above to an obtuse angle; nostrils lateral very small, between two

nasal plates, the upper confluent with the internasal and margining the rostral; parietal band-like, undivided on the middle line. Eyes moderate, surrounded by small scales or resting on labials; throat with small scales; genae shields small, with a distinct longitudinal gular fold; two front upper labial shields large; rest smaller, lower; front lower labial high, slender, hinder lower, small. Body elongate, cylindrical; scales smooth, rhombic, imbricate, lower series largest, in from thirty-seven to forty-five rows; ventral shields narrow, transverse; tail short, blunt at the end; subcaudal plates narrow, six-sided, simple.

The color varies from yellowish or olive brown above and yellow below, to lead-colored above and dirty white below. No markings of any kind.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
4494.....	9-10.	218.	35.	47.	600.	70.
11789.....	10-11.	208.	35.	45.		
11691.....	9-10.	205.	35.	42.		

The extraordinary variability of this species in the squamation of the head may be exhibited in the following table:

I. Internasals confluent with prefrontals.

Loreal present; eye resting on labials Cat. No. 4496

II. Internasals distinct.

 α . Rostral separating internasals on the middle line.

Loreal present; eye on labials on one side; separated by scales on the other Cat. No. 4497

 $\alpha\alpha$. Rostral not separating internasals. β . Eye resting on labials.

Loreal present Cat. Nos. 4497, 11691, 11789, 12581, 12556, 16151, 16152

No loreals Cat. No. 7299

 $\beta\beta$. Eye resting on labials on one side, and not on the other.

Loreal present Cat. No. 4494

 $\beta\beta\beta$. Eye separated from labials on both sides.

Loreal, one on one side, two on the other Cat. No. 8922

Loreals, one on each side Cat. Nos. 16148, 9255

Loreals, none Cat. No. 4492

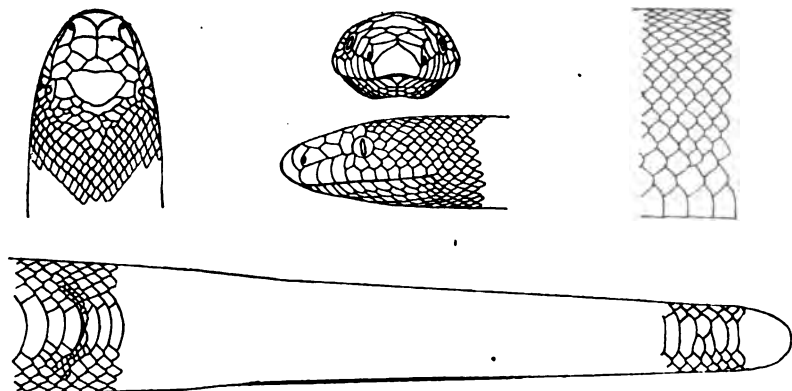


Fig. 149.
CHARINA BOTTÆ BLAINVILLE.
× 1.5.
Summer Lake, Oregon.
E. D. Cope.

None of the North American specimens have the internasals separated on the middle line by a scale, as is stated to be the case in the type of *O. bottæ* by Bocourt. Several have the prefrontals separated by scales, however, so that the character of the type specimen is probably only an individual variation. There is no reason to suppose that the Upper California species differs from that of Lower California. I give the following notes, which I took from Blainville's type in the Museum of the Jardin des Plantes in 1864, by permission of Prof. Auguste Duméril:

The tail enters the total length $9\frac{1}{4}$ times. Frontal much wider than long, post-nasal and loreal longer than wide. One preocular. Ten superior labials, second and third touching loreal, fourth, fifth, and sixth entering orbit. Forty-three rows of scales, size graduating smaller from first to third. A reddish tint in the pale brown of the belly; above slaty brown.

The specimen agreed in size and characters with the one described by Blainville, and I am therefore at a loss to understand the accounts given by Jones and Bocourt. The former says¹ there are but thirty-

¹ Archiv. f. Naturg., I, 1862, p. 242.

nine rows of scales on the body, and the latter says, perhaps by a typographical error, twenty-nine. Bocourt also says that at the period of his writing,¹ 1882, the specimen was no longer in good condition. It was in good condition at the time of my examination in 1864.

The *Wenona isabella* does not appear to me to differ specifically from the other forms. Its head plates display a peculiarity which is also seen in a specimen from California. (See table, pages 728, 729.)

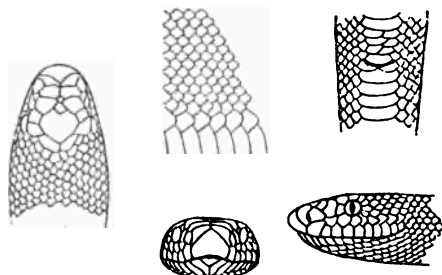


Fig. 150.
CHARINA BOTTÆ BLAINVILLE.
× 1.5.

Showing two rows of loreal plates.

This species ranges throughout the entire Pacific district, as well as the Lower Californian. The most eastern point from which the U. S. National Museum has procured specimens is the John Day River, of Oregon. It has been also obtained in the Great Basin on the Humboldt River, Nevada.

I once took a specimen of the *Charina bottæ* near the shore of

Summer Lake, in Oregon. It was lying in the road stretched at length, but with its muscles alternately knotted, so as to resemble a root. It was very tame and allowed itself to be handled to any extent without attempting to bite. A specimen in the U. S. National Museum contains a small mammal which it had eaten. Another individual was in the act of swallowing a *Sceloporus* when captured and preserved in spirits.

Charina bottæ Blainville.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4499	1	Willamette Valley, Oregon	.....	Lieut. R. S. Williamson, U. S. A.	Alcoholic type.
4497	1	Presidio, California.....	.....	Lieut. W. P. Trowbridge, U. S. A.	do.
8922	1	Oakland, California.....	.....	H. Hemphill.....	do.
4494	1	Fort Steilacoom, Washington.	.....	Dr. Geo. Suckley, U. S. A.	do.
4492	1	Puget Sound, Washington	.....	.....	do.
7299	1	do	.....	.....	do.
594	1	do	.....	A. Campbell.....	do.
9563	1	Eagle Lake, California...	Aug. —, 1877	H. W. Henshaw.....	do.
11691	1	Big Bend of Truckee, Nevada.	July —, 1867	R. Ridgway.....	do.
11789	1	Fresno, California.....	— —, 1879	Gustav Eisen.....	do.
9255	1	(?)	.....	Dr. C. B. R. Kennerly.....	do.
4496	1	Humboldt River, Nevada	.....	Lieut. W. P. Trowbridge, U. S. A.	do.
12581	1	John Day River, Oregon...	.....	Capt. C. Bendire, U. S. A.	do.
12556	1	Fresno, California.....	.....	G. Eisen.....	do.
16148	1	Seattle, Washington.....	.....	O. B. Johnson.....	do.
16149	1	do	.....	do	do.
16150	1	do	.....	do	do.
16151-2	2	do	.....	do	do.

¹ Mission Sci. de Mexique, p. 572.

UNGALIIDÆ.

In *Ungalia* there are no plicæ, and in *U. melanura* there are only four small papillæ systematically arranged. The sulcus and organ are furcate.

No species of this family occur in North America. They exist principally in the West Indies.

AGLYPHODONTA.

The three families of the Aglyphodonta are as follows:

- Two pulmonary lungs; no tracheal lung; a coronoid bone.....XENOPELTIDÆ.
 One pulmonary lung and a tracheal lung; no coronoid bone; postorbital bone produced forward over the orbit.....NOTHOPIDÆ.
 One pulmonary lung with a rudiment of a second; rarely a tracheal lung; no coronoid bone; postfrontal bone not produced over orbit.....COLUBRIDÆ.

XENOPELTIDÆ.

Eyes not covered with a plate; head with normal shields, with an interparietal added; scales smooth; anal and subcaudals divided; teeth equal ..*Xenopeltis* Reinwardt.

The family Xenopeltidæ also belongs to the Palæotropic realm.

I have been unable to determine the penial structure of the only species of the Xenopeltidæ, the *Xenopeltis unicolor* Reinwardt, as all of the four individuals accessible to me are females.

NOTHOPIDÆ.

There are two subfamilies of this family:

- No gastrosteges or urosteges.....ACROCHORDINÆ.
 Gastrosteges and urosteges present.....NOTHOPINÆ.

Of the members of these subfamilies I have only examined the hemipenis of *Chersydrus granulatus* Cuvier. This bifurcates, but not deeply, and the surface below the bifurcation is smooth. The branches are delicately and not closely spinous.

ACROCHORDINÆ.

- Body compressed, acute below.....*Chersydrus* Cuvier.
 Body round, flat below.....*Acrochordus* Hornstedt.

The species of this family are of aquatic habit, and live in the rivers of the Malayan Peninsula and the islands of Sumatra and Java. But three are known.

NOTHOPINÆ.

- Scales above granular, with rows of tubercular scales; urosteges simple; no frontal or parietal plates.....*Xenodermus* Reinwardt.
 Scales squamous; urosteges double; head scaly, with frontal and parietal plates.
Nothopsis Cope.
 Scales squamous; urosteges single; nine normal head plates... *Stoliczkaia* Jerdon.

But three species constitute this family, *Xenodermus javanicus* Reinwardt, from the Malaysian Archipelago; the *Nothopsis rugosus* Cope,¹ from the Darien region of New Grenada, and *Stoliczkaia khasiensis* Jerdon, from S. India.

COLUBRIDÆ.

The natural divisions of this family are clearly indicated by the characters of the hemipenis for the greater part. The characters of the vertebræ can not, however, be neglected, and the dentition in a general way corresponds with the results thus attained. Thus the type of penis with simple sulcus and well-developed ruches includes the large isodont ground snakes and their allies. The types with furcate sulcus with ruches or disc, are nearly always diacranterian in dentition. The Natricine hemipenis is always associated with continued vertebral hypapophyses. The smooth or plicate hemipenis is very seldom associated with such hypapophyses.

I repeat here in the main the groups indicated in my prodomous of 1893, with the omission of the glyphodont genera. As I have not had access to some of the Oriental and African genera, it may be necessary to introduce some changes into some of the groups which include those genera. I also now regard the disciferous type as of equal value with the others.

I. Hypapophyses restricted to the anterior part of the vertebral column.

α. No tracheal lung.

Hemipenis spineless, smooth or plicate or papillose only.....CALAMARINÆ.

Hemipenis with apical disc; no calyces; spinous; sulcus furcate.

XENODONTINÆ.

Hemipenis calyculate, spinous; sulcus furcate; no disc.....DROMICINÆ.

Hemipenis calyculate, spinous; sulcus simple; no disc.....COLUBRINÆ.

α α. A tracheal lung.

Hemipenis as in Dromicine.....LEPTOGNATHINÆ.

II. Hypapophyses present to the caudal region.

Hemipenis smooth, not spinous.....ANOPILOPHALLINÆ.

Hemipenis spinous, without enlarged basal hook.....LYCODYNTINÆ.

Hemipenis spinous, with enlarged basal hook or hooks.....NATRICINÆ.

By far the greater number of snakes belong to the family Colubridæ. They represent all types of relation to the environment; for some are aquatic, and others are terrestrial, some living on the surface of the earth and others burrowing beneath it. Others are more or less arboreal, some ascending to the summits of the tallest trees of the forest, and rarely descending to the earth. None of them are dangerous to man, excepting that some of the larger species could cause the death of children by constricting the neck so as to cause suffocation; but this accident rarely occurs. Most of the species disappear at the sight of man.

CALAMARINÆ.

The genera of this group are of various external forms, and the hemipenis presents considerable variety of structure.

¹ Proc. Acad. Nat. Sci. Phila., 1871, p. 201, pl. xvii, figs. 1-7.

I. FUSIFORM.

- Hemipenis smooth, smooth, simple; sulcus furcate *Calamaria* Boie.¹
 Hemipenis transversely plicate, sulcus simple; extremity with two papillæ; anal divided *Oligodon* Boie.²
 Hemipenis smooth, or nearly so; apex membranous; sulcus simple; anal entire. *Holarchus* Cope.³
 Hemipenis similar to *Holarchus*, but sulcus furcate; anal entire *Dicraulax* Cope.⁴

II. COLUBRIFORM.

III. DIPSADIFORM.

Hemipenis bifurcate, with papillæ at the middle and smooth apex... *Pareas* Wagler.⁵

It is probable that several genera allied to *Calamaria* resemble it in characters, and that *Simotes* Duméril and Bibron belongs near to *Holarchus*. From their general resemblance it is also probable that *Anoplodipsas* Peters and *Amblycephalus* Kuhl belong near to *Pareas*. The subfamily is entirely Oriental.

XENODONTINÆ.

In this group *Lystrophis* has a close external resemblance to *Heterodon*, but the recurved rostral plate occurs also in the Scytaline genus *Rhinostoma*, which has no relationship to either. I formerly referred the Dromicine forms to this subfamily.

After the subtraction of the Dromicinæ a limited number of genera are referable here. They are all colubrifirm and all neotropical.

φ. Rostral plate not recurved.

- Hemipenis undivided; no scale pits *Aporophis* Cope.
 Hemipenis divided; no scale pits *Ophiomorphus* Cope.
 Hemipenis divided; one scale pit *Xenodon* Boie.

φφ. Rostral plate recurved.

- Hemipenis divided; one scale pit *Lystrophis* Cope.

DROMICINÆ.

A. No proximal diverticulum of the left lung.

I. Hemipenis transversely plicated (divided) (Flabellati).

- Plicæ not papillose; diacranterian *Helicops* Wagler.
 Plicæ not papillose; isodont *Pseudoeryx* Fitzinger.
 Plicæ papillose; isodont *Rhabdosoma* Duméril and Bibron.

II. Calyculate, and not capitate (Calyculati).

φ. Hemipenis undivided.

- Fusiform; isodont *Carphophiops* Gervais.
 Colubrifirm; isodont; two nasals *Diadophis* Baird and Girard.
 Colubrifirm; diacranterian; one nasal *Amastridium* Cope.
 Colubrifirm; diacranterian; two nasals *Hypsirhynchus* Günther.

φφ. Hemipenis double.

- Fusiform; isodont; one internasal *Farancia* Gray.
 Fusiform; isodont; two internasals *Abastor* Gray.
 Colubrifirm; diacranterian; no scale pits *Dromicus* Bibron.
 Colubrifirm; diacranterian; one scale pit *Monobothris* Cope.
 Colubrifirm; diacranterian; two scale pits *Halsophis* Cope.

¹ Species examined *C. gervaisii*.

² *O. subquadratus*.

³ *H. ancorus*, *H. dolleyanus*.

⁴ *D. trinotatus*.

⁵ *P. mællendorffii*.

- III. Capitate (or pocketed) (Capitati).
 φφ. Hemipenis undivided.
 Scale pits single; scales smooth *Pliocercus* Cope.
 No scale pits; scales smooth *Rhadinæa* Cope.
 Scales keeled; prenasals in contact... *Tretanorhinus* Duméril and Bibron.
 φφ. Hemipenis divided.
 Rostral normal; isodont *Ninia* Baird and Girard.
- IV. Papillose at apex. (African) (Papillati).
 Hemipenis single *Grayia* Günther.
 Hemipenis bifurcate *Theleus* Cope.
- V. Calyculate, with spinous bands to apex. (Calycispinosi).
 Hemipenis bifurcate; colubriiform *Taniophallus* Cope.
 Subisodont; attenuate *Uromacer* Duméril and Bibron.
- VI. Exclusively spinous to apex (diacranterian). (Spinosi).
 Anterior teeth wanting *Enulius* Cope.
 Anterior teeth present; internasal plates fused; fusiform... *Hydrops* Wagler.
 Anterior teeth present; anal divided; no scale pits; colubriiform; not bifurcate *Echimanthera* Cope.
 Anterior teeth present; anal entire; one scale pit; colubriiform; bifurcate. *Acanthophallus* Cope.
- AA. Left lung with a proximal diverticulum extending to the throat.
- VII. Calyculate and capitate.
 Rostral recurved; hemipenis divided; diacranterian... *Heterodon* Beauvois.

Any one familiar with these genera will perceive that they are not represented in a linear series in the table. He will also observe that genera of probably not very close affinities are placed close together, as, for instance, *Tretanorhinus* and *Helicops* and their associates. This is, however, a necessity of an artificial key and is not new in zoology.

The species of this subfamily are all American, and mostly neotropical. The following genera are found in the Medicolumbian fauna: *Carphophiops*, *Abastor*, *Farancia*, *Diadophis*, *Rhadinæa*, *Heterodon*. Of these, all are characteristically nearctic except *Rhadinæa*, which is neotropical. Of the remaining genera *Hypsirhynchus* and *Neomacer* have been only found on the island of Santo Domingo, while *Adromicus* and *Halsophis* are principally if not entirely West Indian. *Amastridium*, *Pliocercus*, and *Ninia* are Central American and Columbian, while *Tretanorhinus* is the only genus which belongs both to this region and to the West Indian. *Helicops* is confined to the Brazilian district, where it is represented by a number of species.

The fusiform types are *Pseudoeryx*, *Rabidosoma*, *Carphophiops*, *Abastor*, and *Farancia*. The rest are more or less colubriiform, except *Uromacer*, which is very slender, including only tree snakes.

CARPHOPHIOPS Gervais.

Carphophiops GERVAIS, Dict. Hist. Nat. Univers., par D'Orbigny, III, 1843, p. 191.—COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 78.

Celuta BAIRD and GIRARD, Cat. N. Amer., Rept., Pt. 1, Serp., 1853, p. 129.

Carphophis DUMÉRIL, Prodrome Class. Rept. Ophid., 1853, pp. 43-46; Erp. Gén., VII, 1854, p. 131.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 17.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 324.

Head depressed, continuous with the body. Cephalic plates normal,

sometimes no distinct internasal plates. One nasal, nostril in the middle. No anteorbital. Orbit bounded in front chiefly by the loreal, which is large, and slightly by the prefrontals. Scales smooth. Postabdominal scutella bifid. Subcaudals divided.

This genus is the North American representative of the neotropical *Rhabdosoma* and the typical forest burrowers. The species are generally found under stones, and under and in rotten logs, and under the bark, where they readily make their way, forcing their sharp muzzle into narrow places with much muscular strength.

Carphophiops has exactly the plate and scale formula of *Abastor*, but the hemipenis is simple and not bifurcate. It resembles that of *Abastor*, however, in having the sulcus bifurcate, and the apex furnished with calyces in moderate number.

The two species of the genus differ as follows:

Temporal scales 1-2; light color of belly not extending to third row of scales; back paler.....	<i>C. amœnus</i> .
Temporal scales 1-1; light color of belly extending to third row of scales; back darker.....	<i>C. vermis</i> .

CARPHOPHIOPS AMCENUS Say.

Carphophis amœna DUMÉRIEIL and BIBRON, Erp. Gén., VII, 1854, p. 132.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 17.—JAN, Icon. Gen. Ophid., Pt. 12., pl. II, figs. 4, 4B.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 324.

Coluber amœnus SAY, Journ. Acad. Nat. Sci. Phila., IV, 1825, p. 237.—COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 78.—STORER, Rept. Mass., 1839, p. 226.

Calamaria amœna SCHLEGEL, Essai Phys. Serp., 1837, p. 31, pl. I, figs. 19, 20.

Brachyorrhos amœnus HOLBROOK, N. Amer. Herpt., III, 1842, p. 115, pl. XXVII.

Celuta amœna BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 129.

Celuta helene KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1859, p. 100.

Dorsal scales in thirteen rows. Head small; frontal plate hexagonal, nearly as broad as long. Internasals angular, one-third the size of prefrontals, which are likewise angular, and enter posteriorly into the upper portion of the orbit in front. Parietals proportionally large. Rostral broad and well developed. Nasal single, nostril in the middle of the anterior half. A large loreal forming with the prefrontal the anterior part of the orbit. A quadrangular and elevated postorbital. Superciliaries very small and narrow. Snout protruding. Eyes circular, over the commissure of the third and fourth labial. Upper labials five, fifth largest. Inferior labial six, third largest. Temporal shields well developed, two in the vertical row behind the first temporal and last upper labial.

Body very glossy, subcylindrical. Tail short, tapering into a point. Scales rhomboidal, broad, all perfectly smooth. Outer row somewhat larger.

Above uniform chestnut-brown, opalescent; bright salmon color in life beneath.

In nearly half the specimens the internasal scuta are wanting. This condition was supposed by Kennicott to indicate a distinct species

(*C. helenæ* Kennicott), and by some others a distinct genus. There is, however, no other character by which to separate it from the *C. amœnus*, and the character itself is not constant. Thus, in jar Cat. No. 8840, from Union County, Tennessee, one specimen has both internasals, a second

has but one, and a third is without. In jar Cat. No. 12046, from Mount Carmel, Illinois, nearly all the specimens lack the internasals, but one of them has the plate on one side.

Some other variations occur. Thus, in a specimen from Jackson, North Carolina (Cat. No. 1921), the anterior angle of the frontal plate is produced forward to the internasals, completely separating the prefrontals. In Cat. No. 10721, from Washington, District of Columbia, there is but one, a large scute, in the second row of temporals; and two rows of scales are of the color of the abdomen, which contrasts strongly with that of the dorsal regions. The

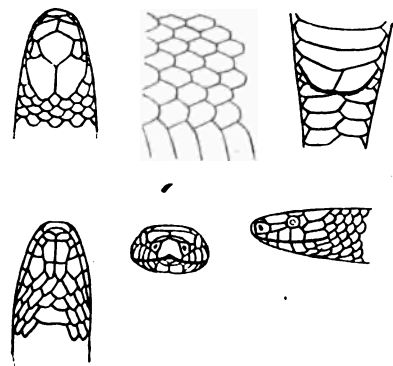


Fig. 151

CARPHOPHIOPS AMŒNUS SAY.

× 2.4.

Mount Carmel, Illinois.

Cat. No. 12046, U.S.N.M.

specimen is quite intermediate between this species and the *C. vermis*. In some specimens the superciliary is larger than the postocular; in others the reverse is the case.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales. ¹	Total length. mm.	Tail. mm.
1925.....	5.	127 + 1.	32.	13.	260.	46.
1878.....	5.	131 + 1.	24.	13.	268.	35.
1874.....	5.	120 + 1.	33.	13.	220.	41.
12046.....	5.	128 + 1.	26.	13.	302.	41.

Carphophiops amœnus Say.[Form *amœnus*.]

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1870	1	Foxburg, Pennsylvania	.....	Prof. S. F. Baird	Alcoholic.
2157	1	Beeleys Point, New Jersey.	.....	do	do.
1931	1	Anderson, South Carolina	.....	Mrs. M. E. Daniel	do.
1873	2	Clarke County, Virginia.	.....	do	do.
1925	1	Weatherfield, Connecticut.	.....	C. Wright	do.
1921	2	Jackson County, North Carolina.	.....	Fitzgerald	do.
1922	1	do	.....	do	do.
8018	1	Washington, District of Columbia.	.....	Dr. E. Coues, U. S. A.	do.
4869	1	Georgia.	.....	Dr. J. Jones	do.
8840	3	Union County, Tennessee.	.....	J. N. B. Scarborough	do.
8934	1	Kinston, North Carolina.	.....	Mason	do.
10721	1	Washington, District of Columbia.	May —, 1880	W. W. Rhee	do.
12047	2	Mount Carmel, Illinois.	Nov. —, 1881	Lucien M. Turner	do.

Carphophiops amœnus Say—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
10720	1	Salem Creek, North Carolina.	— —, 1881	Dr. J. A. Kite, U. S. N.	Alcoholic.
10750	1	Clearwater, Florida.		S. T. Walker	do.
13301	2	Alexandria County, Virginia.			do.
13302	2	Wythe County, Virginia.			do.
14437	1	Dunn Loring, Virginia.		G. D. Figgins.	do.
17445	2	Insane asylum, District of Columbia.		Dr. J. W. Blackburn.	do.
17554	1				do.
19485	1				do.

[Form *helenæ*.]

2183	2	Southern Illinois		R. Kennicott	Alcoholic.
12046	7	Mount Carmel, Illinois		Lucien M. Turner	do.
8853	1	Morton, Ohio		A. H. Little	do.
8792	1	Augusta, Georgia		William Phillips	do.
1874	2	Mississippi		Dr. B. F. Shumard	do.
2183	2	Southern Illinois		R. Kennicott	do.
12128	1	Arlington, Virginia		William Palmer	do.
10656	1	Wheatland, Indiana	Apr. —, 1881	Robert Ridgway	do.
19257	1	Wyandotte, Indiana		G. P. Merrill	do.
19486	1	Insane asylum, District of Columbia.		Dr. J. W. Blackburn	do.

CARPHOPHIOPS VERMIS Kennicott.

Carphophiops vermis KENNICOTT, COPE, Check-list N. Amer. Batr. Rept., 1875, p. 34.*Celuta vermis* KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1859, p. 99.

Scuta as in *C. amœnus*, except that there is but one scale of the second row of temporals. This scale bounds posteriorly both the first temporal and the last labial; a small one below it extends over a part of the posterior border of the last labial.

Larger than *C. amœnus*. Scales in thirteen longitudinal rows. Color above lustrous purplish black, much darker than in *C. amœnus*. Abdomen pale yellowish flesh color (probably brighter in life), this color extending to the third lateral row of dorsal scales.

Though possessing the general form of *C. amœnus*, this differs strikingly in the larger size, darker color of the upper parts, and the extension of the flesh color of the abdomen over to the third lateral row of scales; in *C. amœnus* this color extends only to the second row.

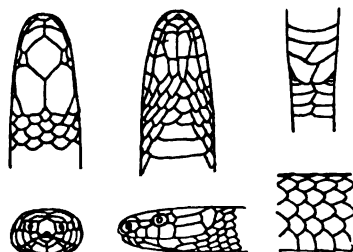


Fig. 152.

CARPHOPHIOPS VERMIS KENNICOTT.

× 24.

Cat. No.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
1918.....	5.	129+1.	23.	13.	266.	21.
6074.....	5.	134+1.	33.	13.	240.	40.

This species always possesses the internasal plates, so far as our knowledge extends. The posterior genaeals are always distinct, though smaller than the anterior.

The distribution of the species is in the southwestern part of the Eastern region. According to Mr. Julius Hurter it is to be found near St. Louis. It occupies the lower ground, while the *C. amoenus* in the same neighborhood is found in the higher ground.

Carphophiops vermis Kennicott.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
6074	1	Fort Scott, Kansas.....	Lieut. Eustis, U. S. A	Alcoholic.
1918	1	Prairie Mer Rouge, Louisiana.....	.....	do.
5563	1	St. Louis, Missouri.....	St. Louis Academy	do.
17698	1	Neosho, Missouri.....	U. S. Fish Commission.....	do.

ABASTOR Gray.

Abastor GRAY, Cat. Snakes Brit. Mus., 1849, p. 78.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 125.—COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 53.—BOULENGER, Cat. Snakes Brit. Mus., II, 1893, p. 289.

Head subconical, continuous with the body. Cephalic plates normal. One nasal, grooved beneath the nostril. No anteorbitals. One loreal together with the prefrontals constituting the orbit anteriorly. Teeth equal. Pupil circular. Scales smooth. Postabdominal scutella bifid. Subcaudal all bifid. Hemipenis bifurcate, each apex with a moderate number of slightly serrate calyces. Spines numerous.

The penial characters of this genus show that it belongs to the *Dromicinae*, near to *Carphophiops*, as I already suggested in 1895.¹ The bifurcation of the organ distinguishes it from that genus. It resembles that of *Farancia* in all essentials, the smaller and more numerous spines offering no greater difference than that which occurs in various genera.

This genus is represented by a single species, which inhabits the southern part of the Nearctic region. It is thus characterized:

Scales in 19 rows; superior labials, 7; tail one-seventh of total length or shorter, bluish black, with 3 red stripes above; below, flesh-colored, with a series of bluish-black spots on each side *A. erythrogrammus*.

ABASTOR ERYTHROGRAMMUS Daudin.

Abastor erythrogrammus GRAY, Cat. Snakes Brit. Mus., 1849, p. 78.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 125.—COPE, Check-list N. Amer. Batr. and Rept., 1875, p. 35.—BOULENGER, Cat. Snakes Brit. Mus., II, 1893, p. 290.

Coluber erythrogrammus DAUDIN, Hist. Nat. Rept., VII, 1799, p. 93, pl. LXXXIII, fig. 2.—HOLBROOK, N. Amer. Herpt., 1st ed., I, 1836, p. 115, pl. XXII.

Helicops erythrogrammus WAGLER, Nat. Syst. Amph., 1830, p. 170.—HOLBROOK, N. Amer. Herpt., 2d ed., III, 1842, p. 107, pl. XXV.

Homalopsis erythrogrammus BOIE, Isis, 1827, p. 551.

Calopisma erythrogrammum DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 337.

¹Trans. Amer. Phil. Soc., XVIII, p. 217.

Vertical plate subhexagonal, long, maintaining its width posteriorly to the point where it enters between the occipitals. Occipitals long anteriorly and posteriorly angular, rounded exteriorly. Postfrontals polygonal, entering into the orbit. Prefrontals proportionally small and subtriangular. Rostral very broad. Nostril in the middle of the nasal, with a groove beneath. Eyes very large. Loreal narrow, forming with the postfrontals the anterior portion of the orbit. Superciliaries large, elongated, sides undulated. Two rounded postorbitals, lower one smallest. A very long temporal shield extending backward beyond the occipitals, and two or three smaller ones scarcely distinguishable from the scales. Mouth deeply cleft. Upper labials, seven, sixth larger; lower labials, seven, fourth larger. Two pairs of mental shields, posterior pair smallest, extending backward beyond the fourth inferior labial. Scales subrhomboidal, smooth, constituting nineteen longitudi-

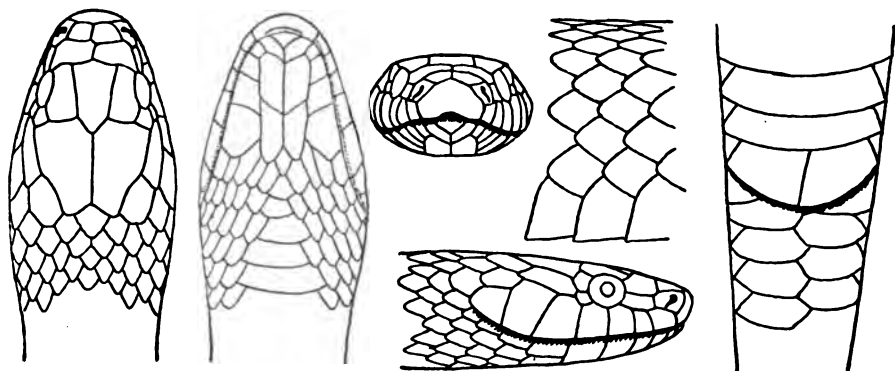


Fig. 153.

ARASTOR ERYTHROGRAMMUS DAUDIN.

Georgetown, South Carolina.

Cat. No. 5556, U.S.N.M.

nal rows; outer rows considerably larger; the others nearly equal amongst themselves, except the second row, which is somewhat larger.

Ground color above bluish black. Dorsal longitudinal red line narrow, embracing only the medial rows of scales, extending from the occipitals to a little way beyond the anus. On each side of this there are three rows of scales of the ground color. Then a longitudinal red line, broader than the medial one, though covering only one row of scales, then again three rows of the ground color. Of the remaining two outer rows of scales the outermost is uniform reddish yellow, and the bases of the scales of the second row have a spot of bluish black. Beneath, two series of bluish black subelliptical and transverse spots, one spot on the exterior third and anterior margin of each scutella. The plates of the head are narrowly margined with yellow. The labials are yellow, with a central black spot.

Baird and Girard give the following scutal formulæ and measurements, the latter in inches:

Locality.	(Gastrosteges.	Urosteges.	Scales.	Length.	Tail.
Southern States (†).....	182 + 1.	37.	19.	15½.	2¾
do	185 + 1.	—	19.	14½.	¾
Savannah, Georgia	179 + 1.	41.	19.	10.	1½
do	179 + 1.	37.	19.	10.	1½

This species belongs to the Austroriparian region, but has not been found up to date as far west as the Mississippi River. I detected it in 1895 on the Pamunkey River, in Virginia. This locality has always been regarded as within the Carolinian district, so that the locality is unexpected.

Abastor erythrogrammus Daudin.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
6426	1	Newberne, North Carolina	.....	Capt. Wm. Holden	Alcoholic.
8292	1	Wilmington, North Carolina.	.....	Dr. A. Reuss	do.
5556	1	Georgetown, South Carolina.	.....	P. J. C. Weston	do.
8049	1	Georgia .....	.....	R. R. Cuyler	Alcoholic type.
5558	3	Pensacola, Florida .....	.....	Dr. R. W. Jeffrey	Alcoholic.
9005	1	Kinston, North Carolina .....	.....	H. W. Welsher	do.
9583	1	Arlington, Florida	April —, 1878	F. G. Goode	Cast.
10672	1	Gainesville, Florida	— —, 1879	James Bell	Alcoholic.

This species is a burrower, and is allied to *Carphophiops*, as I first pointed out. The Pamunkey River specimens were dug from a clay bank beneath ten feet of sand. Mr. Clarence B. Moore, in his excavations of Indian mounds in Florida, has dug it from nearly as great a depth beneath the surface, in sand. This species and the *Farancia abacura* are the largest of the burrowing Dromicinæ.

FARANCIA Gray.

Farancia GRAY, Zool. Misc., 1842, p. 68; Cat. Snakes Brit. Mus., 1849, p. 74.—

BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 123.—COPE, Bull. U. S. Nat.

Mus., No. 32, 1887, p. 52.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 290.

Head subelliptical, elongated, slightly distinct from the body. Internasal plate single. One nasal, grooved beneath the nostril. No pre-orbital; prefrontal and loreal constituting the anterior portion of the orbit. Postorbitals present. Scales smooth. Postabdominal scutella bifid. Subcaudal in pairs. Teeth equal. Hemipenis bifurcate, with a moderate number of dentate calyces, and numerous spines.

In the only species of this genus known the spines of the hemipenis are much larger and less numerous than in *Abastor erythrogrammus*. In both genera the character is different from the allied South American *Pseudoeryx*.

This genus is known only from the Louisianian and Floridian districts of the Austroriparian region. It does not occur in the Texan

district. It is represented by only one species, which is defined as follows:

Dorsal scales in 19 rows; superior labials, 7; two postoculars; tail from one-fifth to one-seventh total length. Bluish-black, with subquadrate red spots on the sides; belly red, with bluish-black spots. *F. abacura*.

FARANCIA ABACURA Holbrook.

Farancia abacura BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 123.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 291.

Coluber abacurus HOLBROOK, N. Amer. Herpt., I, 1836, p. 119, pl. xxiii.

Homalopsis reinwardtii SCHLEGEL, Ess. Phys. Serp. Part. descr., 1837, p. 357.

Hydrops reinwardtii GRAY, Zool. Misc., 1842, p. 67.

Hydrops abacurus DUMÉRIL and BIBRON, Erp. Gén., pl. 65.

Helicops abacurus HOLBROOK, N. Amer. Herpt., 2d ed., III, 1842, p. 111, pl. xxvi.

Farancia drummondi GRAY, Zool. Misc., 1842, p. 68.

Farancia fasciata GRAY, Cat. Snakes Brit. Mus., 1849, p. 74.

Calopisma abacurum DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, pl. 65.

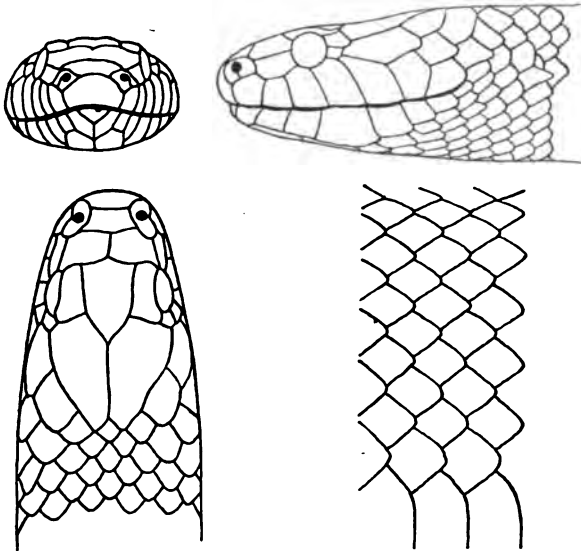


Fig. 154.

FARANCIA ABACURA HOLBROOK.

× .75.

Vertical plate subhexagonal, elongated, sides nearly parallel, pointed posteriorly. Occipitals elongated, angular, posteriorly tapering. Postfrontals subangular, entering in the orbit. Prefrontal angular, well developed. Rostral much broader than high, concave beneath. Nostril in the middle of the nasal plate, visible from above. Loreal elongated, horizontal, forming, together with the postfrontal, the anterior part of the orbit. Eyes circular. Superciliaries subangular, elongated, well developed. Two angular postorbitals, upper one largest, lower one resting on the commissure between the fourth and fifth labials. One

pretemporal shield, large, and four smaller ones. Upper labials seven; fifth and sixth slightly larger. Lower labials eight, fourth largest; the two posterior ones scale-like. Mental scutellæ two pairs, nearly equal in length, posterior pair more tapering. Body subcylindrical, opalescent; tail proportionally short and conical. Scales perfectly smooth, rhomboidal; outer row somewhat broader than the rest. The five medial rows smaller.

Color uniform bluish black above. On the two outer rows the ground color assumes the shape of vertical bands, from one and a half to two scales broad, leaving an intermediate space from two to three scales wide, which is red in life, and dull yellow in specimens preserved in alcohol. Both the red and bluish black extend on the abdomen, the former being the ground color, and the vertical bands of the flank confluent on the middle of the abdomen, either directly opposite or alternating.

Baird and Girard give the following scutal formulæ and measurements, the latter in inches:

Locality.	Gastrostegeæ.	Urostegeæ.	Scales.	Length.	Tail.
Anderson, South Carolina	171+2.	47.	19.	31½.	5½.
Prairie Mer Rouge, Louisiana	173+2.	47.	19.	30¼.	7½.
do	173+2.	47.	19.	16.	2½.

Dr. R. W. Shufeldt found this species abundant near New Orleans. He says that it is generally found in swampy ground, or on the shores of water, coiled beneath logs and other objects. It is of a gentle disposition and grows to a considerable size, one specimen sent by him to the U. S. National Museum measuring nearly 6 feet in length. The species ranges to southern Indiana.

Farancia abacura Holbrook.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
7291	2	Prairie Mer Rouge, Louisiana.	.....	.....	Alcoholic type.
8071	1	do	.....	J. Fairie.	Alcoholic.
8373	1	Wilmington, North Carolina.	.....	Dr. A. Reuss	do.
8035	1	Newbern, North Carolina.	.....	.....	do.
8034	1	Anderson, South Carolina.	.....	Miss C. Paine	do.
6244	1	Pass Christian, Mississippi.	.....	.....	do.
7293	1	Cartersville, Georgia	.....	.....	do.
9599	1	Arlington, Florida	Apr. —, 1878	F. G. Goode	Cast.
10801	1	Chula, Virginia	May 21, 1878	F. H. Cushing	Alcoholic.
14853	1	Wheatland, Indiana	.....	R. Ridgway	do.
12999	2	New Orleans, Louisiana	.....	R. W. Shufeldt	do.
10455	1	Gainesville, Florida	.....	Jas. Bell	do.
13386	1	Wheatland, Indiana	.....	D. Ridgway	do.
13473	1	Alapaha, Georgia	.....	Wm. J. Taylor	do.
14853	1	Wheatland, Indiana	.....	R. Ridgway	do.
14793	1	Orange, Florida	.....	E. H. Park	do.
15374	.....	New Orleans, Louisiana	.....	Dr. R. W. Shufeldt.	.....
15533	.....	Rodney, Mississippi	.....	Gideon Mabbett.	.....

DIADOPHIS Baird and Girard.

Diadophis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 112.—
COPE, Bull. U. S. Nat. Mus., No. 32, 1887, pp. 54-80.

Head normal, distinct from body. Teeth of maxillary bone subequal and in an uninterrupted series. Palatine teeth present. Cephalic plates normal; rostral normal; two nasals; one loreal. Scales smooth, unifossate. Anal plate and subcaudal scuta divided. Hemipenis simple, with numerous simple calyces and numerous spines.

Diadophis is allied to *Dromicus*, but in that genus the last superior maxillary tooth is longer and follows a toothless space, the scales are pitless, and the hemipenis is bifurcate. *Rhadinæa* agrees with *Diadophis* in dentition, but has no scale pits, as in *Dromicus*, and the hemipenis is capitate. Both of these genera are neotropical in distribution. The species of *Diadophis* are North American in distribution, except one from the Bahama Islands. It is, however, not unlikely that other species will be referred to this genus when the characters of their scale pits shall be known.

The North American species of *Diadophis* are difficult to define, owing to their variability. If exceptions to definitions were to be chiefly considered, all might be regarded as one species. They are easily seen to have been of common origin at no very remote period. The number of labial scuta is variable in all of the forms; the number of rows of scales is much less so. The width of the yellow neck collar is very variable; in the *D. regalis* it may be present or absent. The distribution of the spots on the belly, whether regular or irregular, coincides with other character quite closely, but the absence of the median series from the form with three rows is of no significance. The light or dark color of the dorsal region characterizes geographical varieties of each of the three North American species. The species are characterized as follows:

- I. Tail long; urosteges 119; temporals 1-2.
Scales in 17 rows; superior labials, 8; light reddish brown above, white below; unspotted.....*D. rubescens*.
- II. Tail short; urosteges not more than 60; temporals, 1-1; generally a collar.
Scales in 17 rows; superior labials, 7; labials, throat, and belly, irregularly spotted.....*D. regalis*.
Scales in 15 rows; superior labials, 7; labials, throat, and belly irregularly spotted.....*D. amabilis*.
Scales in 15 rows; superior labials, 8; labials, throat, and belly unspotted, or the belly with a median series of spots.....*D. punctatus*.

The *Diadophis rubescens* Cope,¹ inhabits the Bahaman Island of New Providence. The *D. punctatus* is restricted to the eastern region of Nearctica; the *D. amabilis* belongs to the Central, the Pacific, and the Sonoran, while the *D. regalis* is Sonoran, extending its range as far south in Mexico as the Tierra Templada of Vera Cruz.

¹ Proc. Amer. Phil. Soc., 1885, p. 403.

DIADOPHIS REGALIS Baird and Girard.

Diadophis regalis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 115; U. S. and Mexican Bound. Surv., II, 1859, p. 22, pl. XIX, fig. 2.—COPE, Check-list N. A. Batr. Rept., 1875, p. 38.

Coronella regalis BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 208.

Body above uniform greenish ash to blackish brown; beneath light yellow, scattered all over with small black spots. Dorsal scales in 17 rows. Superior labials, 7; temporals, 1-1-1; oculars, 2-2.

Head proportionately short and broad behind; flattened above; snout rounded. Eyes very small. Frontal plate subpentagonal, tapering posteriorly. Superciliaries narrower anteriorly. Body long and subcylindrical. Scales proportionally large and elongated, in 17 rows; those of the outer row conspicuously broader. The upper and lower jaws and inferior surface of head spotted with black, on a light ground. Color of the abdomen extending to the outer row of scales, which are dotted with black posteriorly. The black spots on the abdomen extend considerably beyond the anus.

Two distinct color forms are represented in this species, as follows:
Upper surfaces bluish ashen; color of belly on first row of scales..... *D. r. regalis*.
Upper surfaces to gastrosteges brownish black..... *D. r. arnyi*.

Of fourteen specimens of the *Diadophis regalis* examined, all have seven superior labials but two, which have eight.

DIADOPHIS REGALIS REGALIS Baird and Girard.

Diadophis punctatus regalis COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 80.

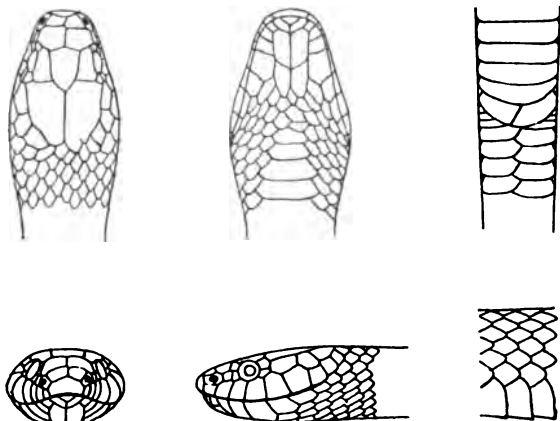


Fig. 155.

DIADOPHIS REGALIS REGALIS BAIRD AND GIRARD.

× 1.5.

Camp Grant, Arizona.

Cat. No. 8019, U.S.N.M.

This subspecies presents great variations in the development of the nuchal yellow collar. In Cat. Nos. 8019 and 2067 it covers five rows of

scales, counted obliquely; in Cat. No. 8427 it covers three. In Cat. No. 8599 it is only present on the side of the neck, and in Cat. Nos. 2064 and 10627 it is wanting. Cat. No. 2064 has eight superior labials. The scuta and measurements given by Baird and Girard are:

Sonora, Mexico; gastrosteges, $237 + 1$; urosteges, 58; total length, $22\frac{1}{2}$ inches; tail, $3\frac{1}{2}$ inches.

Diadophis regalis regalis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2062	1	Sonora, Mexico.....	.....	Col. J. D. Graham, U.S.A.	Alcoholic type.
2064	1	Eagle Spring, Texas .....	.....	Maj. W. H. Emory, U.S.A.	Alcoholic.
10627	1	Fort Davis, Texas	July —, 1878	Hospital Steward W. F. von Manteufel, U. S. A.	do.
10628	1	do.....	do.....	do.....	do.
2067	1	Santa Magdalena .....	.....	.....	do.
8019	1	Camp Grant, Arizona .....	.....	E. Palmer	do.
8427	1	Camp Apache, Arizona .....	.....	H. W. Henshaw	do.
8599	1	Utah .....	.....	Dr. H. C. Yarrow	do.
21061	.....	Fort Huachuca, Arizona	Oct. 11, 1893	Holzner .....	.....
22376	.....	Mezulla Valley, New Mexico.	.....	T. D. A. Cockerell .....	.....

I have this subspecies from Lake Valley, New Mexico, and Professor Snow took it near Socorro, New Mexico, farther north.

DIADOPHIS REGALIS ARNYI Kennicott.

Diadophis arnyi KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1859, p. 99.—COPE Check-list, N. A. Batr. Rept., 1875, p. 38.

Diadophis punctatus arnyi COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 80.

Form slender, head little distinct from body. Body above uniform leaden black, the crown scarcely darker; abdomen yellow, thickly and irregularly spotted with black, the spots more numerous than in *D. docilis*, and extending to some distance behind the anus; head beneath thickly mottled with black spots of much smaller size than those on the abdomen. A narrow, light yellow, occipital ring, one to one and a half scales wide. Dorsal scales in seventeen rows.

Resembles *D. r. regalis*, from which it will be distinguished by the color; also the *D. amabilis*, which has a more slender body and generally narrower head. It is distinguished from this and the forms of *D. punctatus* by the larger number of dorsal rows of scales.

The distribution of this form is wide, extending from Ohio (Cat. No. 10086) to Arizona and Vera Cruz. No specimen has been sent from

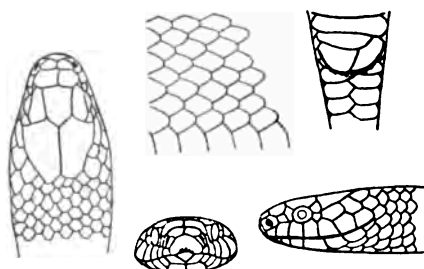


Fig. 156.

DIADOPHIS REGALIS ARNYI KENNICOTT.

× 1.5.

Cat. No. 8427, U.S.N.M.

the Pacific region, and but two from east of the Mississippi River. In a specimen from Vera Cruz everything is normal except temporals 1-2; the additional scale is small. In Cat. No. 1898 the nuchal ring is narrowly interrupted.

Diadophis regalis arnyi Kennicott.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1868	1	Kansas	S. Arny	Alcoholic type.
1898	1	Rock Island, Illinois	J. B. Sargent	do.
2077	1	Mouth of Cache Creek, Colorado.	?	do.
8602	1	Fort Mohave, Arizona	Dr. O. Loew	do.
9760	1	Webster City, Iowa	Chas. Aldrich	do.
10080	1	Hughes, Ohio	R. T. Sheppherd	do.
?	2	Micador, Vera Cruz	Dr. C. Sartorius	do.
16234-5	2	St. Louis, Missouri	Julius Hurter	
16234-5	2	do	I. Knorte	

DIADOPHIS AMABILIS Baird and Girard.

Diadophis amabilis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 113.

D. docilis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 114.

D. pulchellus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 115.

D. punctatus var. *stictogenys* COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 250.

D. texensis KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 328.

Coronella amabilis BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 207.

Body above bluish slate color to deep blackish brown; beneath yellowish white, with crowded small black spots. Occipital ring narrow. Dorsal scales in 15 rows; labial plates 7 above; oculars, 2-2; temporals, 2-2-2.

Head, body, and tail slender; head flattened above; body subcylindrical; tail subconical and tapering into a point. Frontal plate subpentagonal, less tapering posteriorly than in *D. punctatus*, and subacute. Occipitals narrow and elongated. Prefrontals as in *D. punctatus*. Superciliaries narrower and nearly of the same width throughout their length. Upper labials, seven; sixth largest. Lower labials, eight; fifth largest. Scales rather short, subelliptical, considerably larger on the sides than on the back, especially the outer row. Numerous small spots are scattered all over the lower part of the body, from the head to near the end of the tail. The upper surface and sides of head are blackish brown. The ground color of the abdomen is orange in life.

This species exhibits the same range of color variation as in *D. regalis*, with some exceptions. Thus there is a light bluish form and a blackish form, the former western, the latter more eastern. I have seen no specimen without a nuchal collar. The specimens are always smaller and more slender than the fully grown *D. regalis*. These forms are distinguished as follows:

Color above bluish, orange below and on two rows of scales *D. a. pulchellus*.
 Color above bluish to the gastrosteges *D. a. docilis*.
 Color above blackish brown to the gastrosteges; labials brown; ventral spots irregular *D. a. amabilis*.
 Color above blackish to gastrosteges; labials yellow; ventral spots on three series. *D. a. stictogenys*.

The *D. a. pulchellus* and *D. a. amabilis* are Californian; the *D. a. docilis* is known from Texas and Sonora; while the *D. a. stictogenys* ranges from Texas to Louisiana and Georgia.

DIADOPHIS AMABILIS PULCHELLUS Baird and Girard.

Diadophis pulchellus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp. 1853, p. 115.

Diadophis punctatus pulchellus COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 27.

Body above greenish brown, the scales minutely dotted with black. Beneath deep orange-red, with small black spots irregularly scattered all over, from head to near the end of tail. Occipital ring margined anteriorly and posteriorly with a narrow black line.

Head small, body proportionally long and subcylindrical; tail conical, and very much tapering. The frontal plate is subpentagonal, and still less tapering, and less acute than in the preceding species. Superciliaries as in *D. a. amabilis*. Scales subelliptical, elongated. Outer rows larger than the rest, which diminish toward the dorsal line. The bright color of the abdomen extends to the two external rows of scales, which are unicolor, the spots of the abdomen scarcely passing beyond the scutella, although a series of very small spots may be followed along the upper edge of the second dorsal rows of scales close to the color of the back. The upper labials and lower jaw are yellowish white.

I obtained a specimen of this very pretty form in Shasta County, California, in which the inferior surfaces are without spots, and a second from the same locality is in the U. S. National Museum, in which the spots are very few. The *D. a. pulchellus* passes into the *D. a. amabilis*, since, in Cat. No. 11786, but one row of scales is colored like the abdomen.

Eldorado County, California; gastrosteges, 203 + 1; urosteges, 60; total length, 14½ inches; tail, 2½ inches.

Diadophis amabilis pulchellus Baird and Girard.

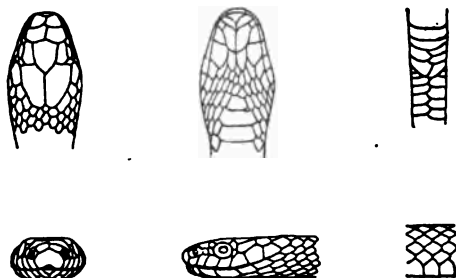


Fig. 157.

DIADOPHIS AMABILIS PULCHELLUS BAIRD AND GIRARD.

× 1.5.

Baird, Shasta County, California.

Cal. No. 11804, U.S.N.M.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
11804	1	Baird, Shasta County, California.	L. Stone	Alcoholic.
7285	1	The Dalles, Oregon	Dr. G. Suckley	do.
2070	1	Petaluma, California	E. Samuels	do.
13798	1	Baird, Shasta County, California.	C. H. Townsend	
20916	.....	Ukiah, Mendocino County, California.	H. W. Henshaw	

DIADOPHIS AMABILIS DOCILIS Baird and Girard.

Diadophis docilis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 114.
Diadophis texensis KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 328.

Body above uniform bluish ash-gray; yellowish white beneath, spotted with black. A yellowish white occipital ring, margined with a narrow black line.

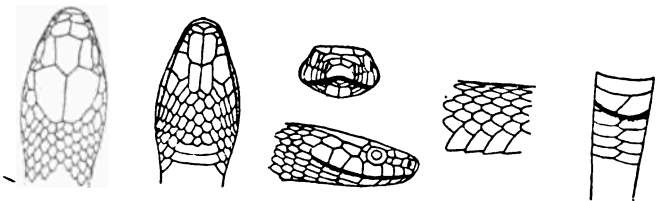


Fig. 158.
DIADOPHIS AMABILIS DOCILIS BAIRD AND GIRARD.
× 2.
Pecos to Rio Grande, Texas.
Cat. No. 2078, U.S.N.M.

Head narrower than in *D. a. amabilis*. Vertical plate subpentagonal, elongated, sides nearly parallel to the point where it enters between the occipitals. Prefrontals and eyes proportionally much smaller than in *D. a. amabilis*. Body very slender, covered with proportionally large

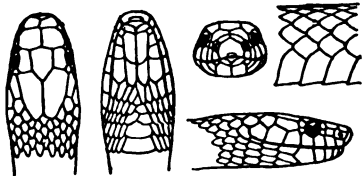


Fig. 159.
DIADOPHIS AMABILIS DOCILIS BAIRD AND GIRARD.
Type of *D. texensis* Kennicott.
× 2.
New Orleans to Galveston.
Cat. No. 1897, U.S.N.M.

scales. Head above blackish brown. Upper labials and head beneath yellowish, mottled with black. Occipital ring yellowish white, covering the length of three scales. The anterior black margin passes to the black spots along the labials. Small black spots are irregularly scattered all over the abdomen; they form one series on each side, along the exterior and posterior margin of the scutellæ, to the tip of the tail. All the scales are uniform ash-gray, but when examined closely they appear punctured with minute black dots. The

bases of the scales are black when stretched apart. The tail beneath is almost unicolor, exhibiting but very few dots.

Devils River, Texas; gastrosteges, 193 + 1; urosteges, 57; total length, 11½ inches; tail, 2½ inches. Two specimens (Cat. Nos. 2078, 5178) have seventeen rows of scales.

Diadophis amabilis docilis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	Nature of specimen.
2076	1	Head of Trinity River, Texas	Alcoholic.
6070	1	Sonora, Mexico	do.
2078	1	Pecos to Rio Grande, Texas	do.
5178	1	Fort Stockton, Texas	do.
1897	1	New Orleans to Galveston, Texas (type of <i>D. texensis</i>) ...	do.

DIADOPHIS AMABILIS AMABILIS Baird and Girard.

Diadophis amabilis BAIRD and GIRARD, Cat. N. A. Rept., 1853, p. 113.

The following description is that of Baird and Girard, taken from the typical specimens:

Color above blackish brown down to the gastrosteges.

Head, body, and tail very slender; head flattened above; body subcylindrical; tail subconical and tapering into a point. Vertical plate subpentagonal, less tapering posteriorly than in *D. punctatus*, and elongated. Occipitals narrow and elongated. Frontals as in *D. punctatus*. Superciliaries narrower and nearly of the same width throughout their length. Upper labials, seven; sixth largest. Lower labials, eight; fifth largest. Scales rather short, subelliptical, considerably larger on the sides than on the back, especially the outer row. Color of the abdomen extending to the outer row of scales, the posterior portion of which alone is black. Numerous small spots are scattered all over the lower part of the body, from the head to near the end of the tail. The upper surface and sides of head, as well as the labials of both jaws and chin, are blackish brown. The abdomen, in life, is in all probabilities purplish, judging of it from traces of that color left beneath the tail of one of the specimens preserved in alcohol.

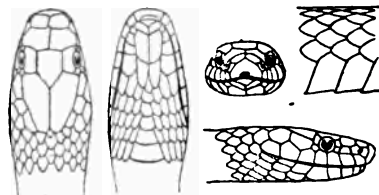


Fig. 160.

DIADOPHIS AMABILIS AMABILIS BAIRD and GIRARD.

× 2.

San Jose, California.

Cat. No. 2061, U.S.N.M.

	Gastrosteges.	Urosteges.	Scales.	Length.	Tail.
San Jose, California (Dr. J. L. LeConte) 182+1.	59.	15.	12½.	2¾.	
do	—	—	15.	9½.	2.

Two specimens from Fresno, California, have the superior labials brown with darker brown spots, and may represent this form. They are of darker color above than either the *D. a. docilis* or *D. a. pulchellus*, resembling the *D. punctatus*. This color is, however, only present on the apex of the scales of the first row in one specimen, and on the apices of those of the first and second on the other, thus approaching the *D. a. pulchellus*. The abdominal spots are large, numerous, and irregular.

Diadophis amabilis amabilis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2061	1	San Jose, California	Dr. LeConte	Alcoholic.
11786	1	Fresno, California	G. Eisen	do.
11802	1	do	do	do.
15376	.....	New Orleans, Louisiana	Dr. R. W. Shufeldt ..	
20483-4	.....	Witch Creek, San Diego County, California.	H. W. Henshaw	

DIADOPHIS AMABILIS STICTOGENYS Cope.

Diadophis punctatus var. *stictogenys* COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 250.

D. punctatus stictogenys COPE, Check-list N. Amer. Batr. Rept., 1875, p. 37.

The regular arrangement of the abdominal spots in three rows approximates this form to the *D. punctatus*. In fact, it only differs from it in the possession of but seven labial plates, and a speckled lower labial and gular region. As occasional specimens of *D. punctatus* are found with only seven superior labials, the approximation is close.

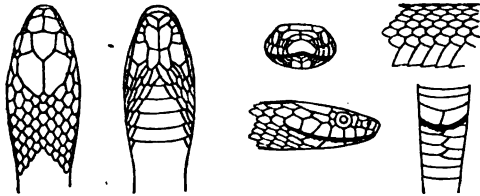


Fig. 161.

DIADOPHIS AMABILIS STICTOGENYS COPE.

× 2.

New Orleans.

Cat. No. 15376, U.S.N.M.

The number of rows of scales is fifteen; the superior labials are seven, eye resting on third and fourth, as is sometimes the case in *punctatus*. Color above light brownish olive, a broad yellow collar, bordered with black as in *punctatus*. Each gastrostegite has a brown dot at its extremity, and the central

part of the margin the same color, forming a series of transversely elongated spots. Fifth and sixth upper labials each with a brown dot. Symphyseal and lower labials with a brown dot in the center of each, two on each anterior genaeal, one at the posterior end of postgenaeals and of all the throat scales.

This form has a distribution confined to the Gulf States, extending from Texas eastward to Savannah, Georgia.

Diadophis amabilis stictogenys Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
15376	1	New Orleans, Louisiana	Dr. R. W. Shufeldt	Alcoholic.
2155	1	Pearl River, Mississippi, to Tennessee.	.....	do.
5016	1	Savannah, Georgia	J. A. Skilton	do.

Cat. No. 2067, from Santa Magdalena, is intermediate between this form and the *C. amabilis puchellus*. The inferior row of scales is colored like the ground of the abdomen, which has rather numerous, irregular, dark spots. The color of the upper surfaces is like that of *D. a. pulchellus*, and the lips and throat are sparsely spotted.

DIADOPHIS PUNCTATUS Linnaeus.

Diadophis punctatus BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 112.—COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 250.—JAN, Arch. Zool. Anat. Phys., II, 1863, p. 263; Icon. Gen., 1866, p. 15, pl. VI, fig. 1.—GARMAN, N. Amer. Rept., 1883, p. 72, pl. II, fig. 2.—BOCOURT, Miss. Sci. Mex., Rept., 1886, p. 618, pl. XL, fig. 1.—COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 617.—H. GARMAN, Bull. Ill. Lab., III, 1892, p. 300.

Coluber punctatus LINNÆUS, Syst. Nat., I, 1766, p. 376.—DAUDIN, Rept., VII, 1803, p. 178.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 354; Med. Phys. Res., 1835, p. 117.—STORER, Rep. Fish and Rept. Mass., 1839, p. 225.—HOLBROOK, N. Amer. Herp., III, 1842, p. 81, pl. XVIII.—DEKAY, N. Y. Fauna, III, 1842, p. 39, pl. XIV, fig. 29.

Coluber torquatus SHAW, Zool., III, 1802, p. 553.

Calamaria punctata SCHLEGEL, Phys. Serp., II, 1837, p. 39.

Ablabes punctatus DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 310.—GÜNTHER, Cat. Snakes Brit. Mus., 1858, p. 28.

Ablabes occipitalis GÜNTHER, Cat. Snakes Brit. Mus., p. 29.

Diadophis occipitalis COPE, Proc. Acad. Nat. Sci. Phila., 1850, p. 250.

Diadophis punctatus, var. *pallidus* COPE, Proc. Acad. Nat. Sci. Phila., 1850, p. 250.—BOCOURT, Miss. Sci. Mex., Rept., p. 621.

Diadophis dysopes COPE, Proc. Acad. Nat. Sci. Phila., 1850, p. 251.

Coronella punctata BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 206.

A yellowish white occipital ring. Body bluish black above; yellowish orange beneath, with a medial series of spots, sometimes absent. Tail beneath unicolor. Dorsal scales in fifteen rows; superior labials eight; temporals 1—1.

Head very much depressed, flattened above; snout rounded and overlapping the lower jaw. Frontal plate subpentagonal, tapering backward, posteriorly acute. Parietals large, elongated, subangular. Internasals irregularly rounded, half the size of the prefrontals. Rostral broad, but low. Nasal plates large, nostril intermediate. Loreal quadrilateral. Two anteorbitals, inferior one narrow and the smaller. Superciliary well developed, broader posteriorly than anteriorly. Two postorbitals, inferior one very small, situated above the junction of the fifth and sixth upper labials. Temporal shields conspicuous, anterior one larger and elongated. Upper labials eight; seventh the largest, fourth and fifth forming the lower part of the orbit. Lower labials eight; fifth the largest. Two pairs of mental scutella, extremity of the posterior pair extending beyond the fifth lower labial. Temporals 1—1.

Body slender, subcylindrical; tail tapering. Scales subelliptical;

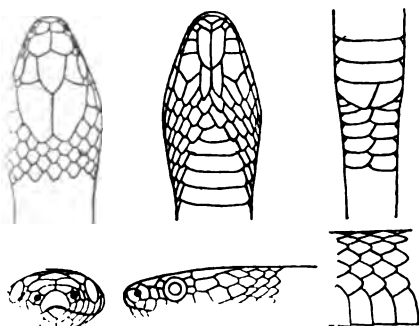


Fig. 162.

DIADOPHIS PUNCTATUS LINNÆUS.

= 1.

Florida.

Collection of E. D. Cope.

outer row but slightly larger. Occipital ring of the width of two scales, sometimes narrower. Upper labials yellowish, like the lower jaw and inferior surface of head and abdomen. A series of dark subtriangular spots along the lateral margins of the scutellæ, and in contact with the dark color of the flanks. Abdomen either unicolor or provided with series of similar dark spots along its middle region, from the anterior third of the body to near the anus. The spots sometimes elongate transversely in the shape of bars across the abdomen.

A specimen from Anderson, South Carolina, exhibits a somewhat slenderer head, and a narrower and more elongated frontal plate.

Another very young specimen from Mississippi has a shorter head, and a frontal plate proportionally much broader and shorter.

Baird and Girard give the following scutal formula and measurements, the latter in inches:

Locality.	Gastrosteges.	Urosteges.	Length.	Tail.
Carlisle, Pennsylvania.....	148 + 1.	53.	13 $\frac{1}{2}$.	3
Carlisle, Pennsylvania.....	158 + 1.	50.	13.	2 $\frac{1}{2}$
Carlisle, Pennsylvania.....	158 + 1.	52.	14.	3
Carlisle, Pennsylvania.....	148 + 1.	44.	11 $\frac{1}{2}$.	2 $\frac{1}{2}$
Foxburg, Pennsylvania.....	161 + 1.	56.	14 $\frac{1}{2}$.	3 $\frac{1}{2}$
Pittsburg, Pennsylvania.....	159 + 1.	50.	15 $\frac{1}{2}$.	3 $\frac{1}{2}$
French Creek, Pennsylvania.....	157 + 1.	36.	13 $\frac{1}{2}$.	2 $\frac{1}{2}$
Lebanon Spring, New York.....			5.	1 $\frac{1}{2}$
Georgia.....	141 + 1.	48.	10 $\frac{1}{2}$.	2 $\frac{1}{2}$
Riceboro, Georgia.....	145 + 1.	36.	10.	1 $\frac{1}{2}$
Anderson, South Carolina.....	155 + 1.	44.	14 $\frac{1}{2}$.	2 $\frac{1}{2}$

Of thirty-three specimens examined, six have seven superior labials on both sides, and four have eight on one side and seven on the other.

Those with seven on both sides are Cat. Nos. 1899, 1969, 7286, 7287, 7288, and 9720. In Cat. No. 7287 the abdominal specks are sparse and are irregularly arranged, thus approaching the *D. amabilis*, but the labial plates are unspotted. Occasionally a specimen is found in which the nuchal yellow collar is interrupted on the middle line; such are Cat. Nos. 9115, 7288, and those of five numbered

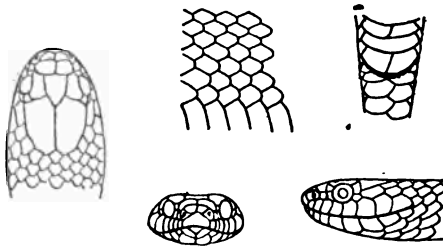


Fig. 163.

DIADOPHIS PUNCTATUS LINNÆUS.

Type of *D. dysopes*.

× 1.5.

Museum, Academy of Natural Sciences Philadelphia.

Cat. 11984. The latter and Cat. No. 10585 are from Florida. They differ from specimens from other localities in the larger size of the ventral spots, and some of them have the lower labials or gular region slightly dusted with black. The dorsal color is very dark.

This species is abundant in the eastern region of North America, to which its range is restricted. It is found coiled up under stones, logs,

or bark of fallen trees, chiefly in forests. It is very harmless, and makes no hostile demonstrations. It lives on insects, batrachians, reptiles, etc. A Floridan specimen contained an *Engystoma carolinense*.

The specimen on which I proposed the species *Diadophis dysopes* is somewhat abnormal. The internasals and prefrontals are rather wider in proportion to their length than usual and the frontal plate is smaller in relation to the superciliaries. The nuchal collar is narrower than usual, covering only a part of a scale. Approximations to the scutal characters are seen in other specimens; and the width of the collar is not uniform. Until more is known of the form I let it remain with the *D. punctatus*. Its habitat is unknown.

A specimen with narrow collar interrupted on the middle line of the nape was described as a distinct species by Dr. Günther under the name of *D. occipitalis*. A similar specimen has come under my notice. It is referable to the *D. punctatus*.

Diadophis punctatus Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1880	1	Carlisle, Pennsylvania.....	.....	Prof. S. F. Baird	Alcoholic type.
1890	1	Pittsburg, Pennsylvania.....	.....	.....	Alcoholic.
1895	1	Anderson, South Carolina.....	.....	Miss C. Paine	do.
2154	2	Columbus, Georgia.....	.....	Dr. Geaner	do.
1969	1	Tyree Springs, Tennessee.....	.....	Prof. R. Owen	do.
7286	1	Marietta, Ohio.....	.....	Prof. E. B. Andrews.....	do.
1900	1	New York.....	.....	Prof. S. F. Baird.....	do.
1967	2	Southern Illinois.....	.....	R. Kennicott.....	do.
7834	1	Washington, District of Columbia.....	.....	Dr. E. Cones, U. S. A.....	do.
1881	2	Somerville, North Carolina.....	.....	.....	do.
4823	1	St. Catherine, Canada.....	.....	Dr. D. W. Beadle.....	do.
8794	1	Augusta, Georgia.....	.....	William Phillips.....	do.
9110	1	Marietta, Georgia.....	.....	.....	do.
9115	1	Wilmington, North Carolina.....	.....	.....	do.
9125	1	Newport, Rhode Island.....	Nov. 8, 1875	Samuel Powell.....	do.
9720	1	Moulton, Alabama.....	, 1856	.....	do.
9996	1	Middletown, Connecticut.....	.....	Museum Wesleyan University.....	do.
10585	1	Clear Water, Florida.....	July 14, 1879	S. T. Walker.....	do.
11399	1	Washington, District of Columbia.....	Aug. 27, 1881	C. Robinson, jr.....	do.
11984	4	Georgiana, Florida.....	.....	William Wittfield.....	do.
9099	1	.....	.....	.....	do.
1899	1	Cleveland, Ohio.....	.....	.....	do.
7288	1	Minnesota.....	.....	C. Bellmann.....	do.
7287	1	Southern Illinois.....	.....	R. Kennicott.....	do.
13296	1	Washington, District of Columbia.....	.....	George Shoemaker.....	do.
13966	1	Grayling, Michigan.....	.....	G. H. Hicks.....	do.
14108	1	Gainesville, Florida.....	.....	W. H. Dall.....	do.
9304	1	Upper Mississippi.....	.....	.....	do.
12022	1	Mount Carmel, Illinois.....	.....	L. M. Turner.....	do.
13667	1	Georgiana, Florida.....	.....	W. Wittfield.....	do.
13702-5	2	do.....	.....	do.....	do.
13966	1	Grayling, Michigan.....	.....	G. H. Hicks.....	do.
17290	1	Washington, District of Columbia.....	.....	C. W. Richmond.....	do.
15322	.....	.....	.....	.....	.....
19793	.....	Mount Vernon, Virginia.....	.....	J. H. Kuehling.....	.....

RHADINÆA Cope.

Rhadinæa COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 132; Proc. Amer. Phil. Soc., 1886, p. 487; Journ. Acad. Nat. Sci. Phila., 1875, p. 138.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 160.

Posterior maxillary teeth little longer, or not longer than the anterior; hemipenis undivided, with more or less papillose calyces at the apex, the whole calyculate surface presenting a free margin (capitate), from below which the spines issue. Cephalic plates normal; two nasals and one loreal. Postabdominal and caudal scuta divided. Scales smooth, poreless; colubriform.

This genus is represented throughout Mexico and Central America by numerous species, and perhaps in South America, but the penial characters of the species of the latter region referred to it are unknown. None of them are of large size, and they frequently display ornamental colors. The type is *R. obtusa* Cope.

A single species enters the United States, which has been found so far only in the southeastern part of our country.

Some of the species of *Rhadinæa* have a pseudopreocular plate, a character which I find generally constant. The division of the large preocular is, on the contrary, inconstant.

Boulenger has referred to this genus the species placed by Duméril and Bibron in the genus *Liophis*. These must be omitted, as I have shown that they possess the penial characters of the *Xenodontinæ*. The following synopsis includes all the species which I suppose to belong to the genus so far as known:

I. Scales in fifteen rows (eight superior labials).

Postoculars, three; four inferior labials in contact with pregenials; brown, with dark cross-bands; a large dark spot on nape.....*R. melanauchen* Jan.
Postoculars, two; four or five labials in contact with pregenials; olive, with alternating dark spots; sides darker; a white line around snout.

R. occipitalis Jan.

II. Scales in seventeen rows.

A. No pseudopreocular scale.

α. Seven superior labials (four inferior labials in contact with pregenials).

Frontal plate shorter; urosteges 58-71; no stripes; a black transverse band on occiput.....*R. affinis* Günther.

Frontal plate longer; urosteges 66-75; three longitudinal rows of spots or stripes.....*R. pacilopogon* Cope.

Frontal plate medium; urosteges 77; light-yellow brown; sides yellow.
R. flavilatus Cope.

Frontal plate elongate; urosteges 85-95; brown, sides paler; a yellow line around snout.....*R. laureata* Günther.

αα. Eight superior labials (five inferior labials joining pregenial).

Urosteges 79; four longitudinal bands.....*R. vermiculaticeps* Cope.

Urosteges 91; three longitudinal bands, the median extending to end of muzzle.....*R. fulvivittis* Cope.

AA. A pseudopreocular scale (eight superior labials).

β. Four labials in contact with pregenials.

Urosteges 109; no bands on head; lips strongly black spotted; body bands obscure.....*R. fulviceps* Cope.

Urosteges 78; a black, yellow-edged band from eye to angle of mouth; sides dark; a yellow stripe each side of nape.....*R. lachrymans* Cope.

$\beta\beta$. Five labials in contact with pregenials.

Gastrosteges "145-183;" frontal and supraoculars wider; banded, yellow head bands not black-edged..... *R. vittata* Jan.

Gastrosteges "117-137;" frontal and supraocular plates narrower; yellow head bands black-bordered..... *R. decorata* Günther.

III. Scales in 19 rows.

(Eight superior labials; pregenials joining five labials.)

Frontal wider, supraocular suture wider than anterior suture; scuta 164 + 78; brown, with six longitudinal pale stripes..... *R. serperastræ* Cope.

Frontal narrower, anterior suture shorter than supraocular; scuta 155-183 + 51-60; brown, scales darker-edged; scuta yellow, black-edged.

R. obtusa Cope.

IV. Scales in 21 rows.

No pseudopreocular; superior labials eight; four inferior labials joining pregenials; frontal wide; pale brown with 3-5 longitudinal stripes.

R. godmanii Günther.

The distribution of this species is as follows:

NEOTROPICAL SPECIES.

Continental: *R. melanauchen*; *R. occipitalis*; *R. affinis*; *R. paucilopogon*; *R. obtusa*.

Central American: *R. vermiculaticeps*; *R. fulviceps*; *R. lachrymans*; *R. serperastræ*; *R. godmanii*.

MEDICOLUMBIAN SPECIES.

Toltecan: *R. laureata*; *R. decorata*; *R. vittata*; *R. fulvivittis*.

Austroriparian: *R. flavilatus*.

These snakes are of feeble organization and small to medium size. They usually display brilliant colors, which are soon lost in alcohol.

RHADINÆA LAUREATA Günther.

Rhadinea laureata COPE, Journ. Acad. Nat. Sci. Phila., 1875, p. 140.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 179.

Dromicus laureatus GÜNTHER, Ann. Mag. Nat. Hist. (4), I, 1868, p. 419, pl. XIX, fig. E; Biol. Centr.-Amer., Rept., 1893, p. 112, pl. XL, fig. A.—BOCOURT, Miss. Sci. Mex., Rept., 1890, p. 710, pl. XLV, fig. 1.

The following description is copied from Günther, as no specimen has come into my hands:

Scales smooth, in seventeen rows, many with a small apical groove. Form of the head as in *Coronella lævis*; body and tail moderately slender. Eye of moderate size; the rostral does not extend to the upper surfaces of the head; anterior frontals scarcely half as large as posterior; vertical longer than the snout, but shorter than the occipitals, which are rounded behind; loreal square; one preorbital, reaching to the upper surface of the head, but not extending on to the vertical; two postoculars; seven upper labials, the third and fourth entering the orbit; temporals 1+2+3, the anterior in contact with both postoculars; two pairs of chin-shields, nearly equal in length; ventrals 163; anal bifid; subcaudals 95.

A lead-colored band, three scales broad, runs from the nape, along the median line of the back, to the end of the tail; flanks reddish, with a very indistinct grayish streak along the fourth outer series of scales; two yellow lines across the rostral, the lower runs along the upper labials and across the neck, thus entirely encircling the head; the upper runs along the canthus rostralis, and stops or terminates in the temporal region. Lower parts uniform yellowish.

One specimen was in a collection made by Dr. Doorman, in the neighborhood of the City of Mexico. It is 21 inches long; head 6 lines; tail 7 inches.

The dentition of this species is neither distinctly diacranterian nor syncranterian. The maxillary is armed with nine teeth, gradually becoming stronger, longer, and more widely set behind; the last is conspicuously the longest, but scarcely more distant from the penultimate than this is from the antepenultimate, although these three teeth are much more distant than the others are from each other.

RHADINÆA FULVIVITTIS Cope.

Rhadinæa fulvivittis COPE, Journ. Acad. Nat. Sci. Phila., 1875, p. 139.

Head small, not very distinct from body. Frontal a little longer than the suture from it to the nasal, and a little shorter than common suture of occipitals, two-thirds as wide as long. Rostral small, low; post-nasal higher than long; loreal as high as long. Superior labials eight, seventh highest; temporals 1-1. Inferior labials ten, sixth largest, in contact with middle of post genieals. Scales poreless. Gastrosteges one hundred and seventy-seven; anal divided; urosteges ninety-one.

Color above fulvous, below fulvous yellow. The three brown bands extend from the end of the nose to near the end of the tail; the lateral involves the fourth and the half of each adjacent row of scales, and is black edged; the dorsal is three and two half scales wide and is also black edged. The brown is paler on top of the head and the ground color is a narrow, yellow band to the eye. Lips yellow, like the lower surfaces, unspotted.

This species is allied to the *R. vittata* Jan, with which Boulenger unites it. The absence of the pseudopreocular, and the short loreal plate, do not agree with the specimens of the latter.

Rhadinæa fulvivittis Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
7075	1	Orizaba, Mexico	F. Sumichrast	Alcoholic.

RHADINÆA VITTATA Jan.

Rhadinæa vittata COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 80.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 178.

Enicognathus vittatus JAN, part, Arch. Zool. Anat. Phys., II, 1863, p. 271; Icon. Gen. Ophid., 1866, pl. II, fig. 3.—BOCOURT, Miss. Sci. Mex., Rept., 1886, p. 630, pl. XLI, fig. 1.

Dromicus teniatus PETERS, Monatsb. Akad. Wiss. Berl., 1863, p. 275.—GÜNTHER, Biol. Centr.-Amer., 1894, p. 113.

Rhadinæa teniata COPE, Journ. Acad. Nat. Sci. Phila., 1875, p. 140.

Diadophis decoratus GARMAN, Bull. Essex Inst., XIX, 1888, p. 127.

Rhadinæa quinquelineata COPE, Proc. Amer. Phil. Soc., XXIII, 1866, p. 277.

Coronella quinquelineata GÜNTHER, Biol. Centr.-Amer., Rept., 1893, p. 111.

Dromicus omillemanus GÜNTHER, Biol. Centr.-Amer., 1894, p. 113, pl. XL, fig. B.

The following description I have copied from Peters, as covering the characters of the species thoroughly:

Head and body elongate, the latter covered with 17 longitudinal rows of pitless scales. Rostral much wider than high, scarcely reaching the superior surface of the

muzzle; postnasal higher than prenasal shield; frenal much longer than high; parietals about half as much longer as the median frontal, which is about the length of the muzzle. Supralabials eight, of which the fourth and fifth are in contact with the eye; one anteorbital, two postorbitals, which are in contact with an elongate temporal; two pairs of submentals, of which the hindmost is perceptibly the longest; ten infralabials, of which six are in contact with the submentals; gastrosteges one hundred and fifty-five, one divided anal and one hundred and eight divided urosteges, or $172 + 1 + 91$.

Ground color brown. A broad longitudinal dark brown or black line covers the three median dorsal rows and the half of each of the external rows in contact with them, or, it is composed of three separate longitudinal stripes, of which the median is bordered on either side by a series of small, oblique streaks on the external border of the median row of scales and the inner edges of the scales of the rows bordering it on either side; on each side and continuous with the transverse rostral band, a lateral, longitudinal black stripe passing through the eye to the end of the tail, which is separated from the median dorsal line by two half, or one and two half scales, the line itself two half scales wide, or descending to the third lateral row and embracing two entire and almost two half rows. The brownish-yellow stripe which separates the dorsal from the lateral stripes begins at the muzzle, interrupted by the eye and passes backward along the external border of the parietals. Posteriorly on the external ends of the ventrals there is a black point, which form lateral punctated lines on the anterior ventral side. Dirty yellow ventrally and on the supralabials.

Behind a series of shorter and nearly isodont teeth, separated by a diastema, there follows a longer smooth tooth.

Total length, 505 mm.; head, 16 mm.; tail, 177 mm.; width of head, 85 mm.; width of body, 9 mm.; in another specimen: Total length, 325 mm.; head, 12 mm.; tail, 91 mm.

The specimens which have come under my observation have been of the color variety in which the median brown dorsal band is represented by three narrow stripes, of which the median is the narrowest. One of these came from the State of Puebla and the two others from Zacualtipan (Hidalgo) from Dr. S. Bernard. It was on these that I proposed the name *R. quinquelineata*.

According to Günther this species is common in the high lands of Guerrero, and Boulenger gives it from Jalisco and the City of Mexico. All of these localities are at an elevation of 8,000 feet or more. Dugès gives Guadalajara.

From the stomach of a specimen from Zacualtipan I took an adult *Spelerpes leprosus*.

RHADINÆA DECORATA Günther.

Rhadinaea decorata BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 176; synonymy, not description.

Coronella decorata GÜNTHER, Biol. Centr.-Amer., Rept., 1893, p. 111.

Enicognathus vittatus JAN, part, Arch. Zool. Anat. Phys., II, 1863, p. 271; Icon. Gen. Ophid., 1866, pl. II, fig. 2.

There are two well-marked color varieties of this species which agree in structural characters so far as I can see. They differ as follows:

Yellow dorsolateral stripes continued to end of muzzle..... *R. d. ignita* Cope.
Yellow dorsolateral stripes broken into two distinct spots on temporal region.

R. d. decorata Günther.

The *R. d. ignita*¹ has been found so far only in Costa Rica and the Atlantic side of Panama types from the latter region, and so does not come within the scope of the present book.

RHADINÆA DECORATA DECORATA Günther.

Rhadinæa decorata COPE, Proc. Acad. Nat. Sci. Phila., 1863, p. 101; Journal Acad.

Nat. Sci. Phila., 1875, p. 138.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 176, description.

Coronella decorata GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 35.

Diadophis decoratus COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 250.—BOCOURT, Miss. Sci. Mex., Rept., 1886, p. 624, pl. XL, fig. 3.

This handsome snake belongs to the Central American region, ranging to Costa Rica, inclusive. It wanders into the borders of the Toltecan subregion at a few points. Sumichrast says that it is abundant about Orizaba.

Rhadinæa decorata decorata Günther.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
9055	1	Orizaba, Mexico.....	F. Sumichrast	Alcoholic.
	5	Costa Rica.....	W. M. Goble.....	do.

RHADINÆA LACHRYMANS Cope.

Rhadinæa lachrymans COPE, Journ. Acad. Nat. Sci. Phila., 1875, p. 140; Bull. U. S.

Nat. Mus., No. 32, 1887, p. 80.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 174.

Lygophis lachrymans COPE, Proc. Amer. Phil. Soc., 1869, p. 154.

Dromicus lachrymans GÜNTHER, Biol. Centr.-Amer., Rept., 1894, p. 114.

Scales in seventeen series, obtuse, pitless. Muzzle short; rostral shield not as high as wide, not prominent. Internasals broader than long; frontal broad, shorter than occipitals, with a right angle behind; superior labials eight, fourth and fifth only in orbit, sixth only higher than long. Loreal longer than high; oculars 1-2 and a pseudopreocular, the anterior not reaching frontal; temporals 1-2. Inferior labials large, nine; four only in contact with pregeneials, which are shorter than postgeneials. Gastrosteges one hundred and seventy-three; anals 1-1; urosteges seventy-eight.

Color above, chestnut brown; ends of gastrosteges and first three and a half rows of scales blackish, yellowish margined above from side of neck to end of tail. On the anterior half the body is divided by a yellowish band on the first and second rows of scales. Below and labials bright yellow, the superior labials each with a dark brown spot on the center, and the anterior inferior with the same. A brown band round the muzzle which, passing through the eye, crosses the middle of the last superior labial, and is continuous with a brown band on each side

¹ *Dromicus ignitus* Cope, Proc. Acad. Nat. Sci. Phila., 1871, p. 201. *Rhadinæa ignita* Cope, Journ. Acad. Nat. Sci. Phila., 1875, p. 140; Proc. Amer. Phil. Soc., XXXI, 1893,

⁴ *Coronella ignita* Günther, Biol. Centr.-Amer., Rept., 1893, p. 111.

of the neck, which gradually disappears in the dark hue of the sides. This band to the last labial is bordered above by a yellow stripe, which does not join the yellow stripe on the side of the neck. It is dark brown, bordered above. Head above light brown, with two yellow brown-bordered parietal spots such as are usually present in water snakes.

Measurements.—Total length, 385 mm.; tail, 99 mm.

This species approaches equally several species, but differs from all others. It combines a long body and short tail, with large and few inferior labials, as in *R. fulviceps*, which is a long-tailed species, with a different coloration.

We owe this species to Sumichrast, who states in his notes that he is not sure of the locality where he obtained it, but thinks it is Orizaba.

Rhadinæa lachrymans Cope.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
1	Orizaba, Mexico.....	F. Sumichrast.....	Alcoholic.

RHADINÆA FLAVILATA Cope.

Rhadinæa flavilata COPE, Proc. Acad. Nat. Sci. Phila., 1891, p. 429.

Dromicus flavilatus COPE, Proc. Acad. Nat. Sci. Phila., 1871, p. 222; Check-list, N. Amer. Batr. Rept., 1875, p. 38; Proc. Amer. Phil. Soc., 1878, p. 64; Proc. U. S. Nat. Mus., XI, 1888, p. 386.

Habit moderately slender; tail 3.2 times in total length; head distinct, elongate, oval. Scales very thin, without scale-pores, in seventeen longitudinal series. Superior labials seven, third and fourth in orbit; fifth higher than long, with sixth separated by a narrow temporal from occipital; seventh longer than high. Inferior labials nine, four bounding genaeals. Postgenaeals longer than pregenaeals. Internasals nearly quadrate; prefrontals longer than wide. Frontal, anterior width 0.75 length; parietals rather elongate. Nostril in prenasal, which is lower than postnasal; loreal very small, high as long; oculars 1-2. Gastrosteges 126; urosteges 77.

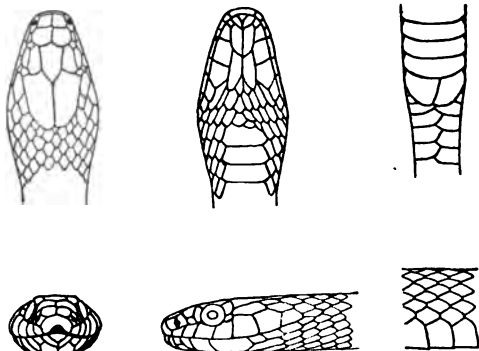


Fig. 164.

RHADINÆA FLAVILATA COPE.

× 1.5.

Volusia, Florida.

Collection of E. D. Cope.

Color above, a rich golden brown, the scales of the two inferior rows on each side broadly gold-edged, the color of the back beginning on

the third row. The ends of the scales of the vertebral row are sometimes darker tipped. Head dark brown, darkest behind, with numerous but obscure paler vermiculations. Sides of head pale with a reddish-brown band from the rostral plate through the eye to the middle of the last labial. Labials whitish, with black dots on the posterior, in oblique rows. Below white, lower labials sparsely black dotted. A pair of pale dots on the common occipital suture.

This is a snake of rather feeble character. I observed a specimen from Fort Macon, North Carolina, which I owed to my friend, Dr. H. C. Yarrow, for several months in confinement. It was rather inactive.

The *Rhadinaea flavilata* has been found along the southern Atlantic coast region from southern North Carolina to southern Florida. It is more common in the latter region than elsewhere.

Rhadinaea flavilata Cope.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
4	Georgiana, Florida.....	W. Wittfield	Alcoholic.

HETERODON Latreille.

Heterodon LATREILLE, Hist. Nat. des Reptiles, IV, 1799, p. 32.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 766.—BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 51.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 82.—COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 54.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 153.

Dentition diacranterian. Caudal scutella divided; anal plate double. Rostral plate recurved, with transverse upturned edge and flat antero-inferior face. The nine cephalic plates, a loreal, two nasals and ocular plates present, with one or more supplemental behind the rostral. Scales keeled, bifossate. Pupil round. Form robust. Hemipenis bifurcate, the apices with numerous papillose calyces, and separated by a free margin from the spinous portion. Spines numerous, hooked. An enormous diverticulum of the left lung extending to the throat.

The few species of this genus which are known agree also in having a series of scales separating the eye from the superior labial plates, and in having an azygous plate behind the rostral. The postero-superior aspect of the rostral plate has a keel on the middle line, and there are from three to five, generally four, scales in the first temporal row. The tail is short. The anterior ribs are capable of extension so as to flatten that part of the body, as is done by the cobras of the genus *Naja*, but the expansion is not so wide, and it has greater longitudinal extent. The postgenaeal plates are reduced to a very small size, and are separated from each other by small scales.

The species of this genus range throughout North America excepting the Pacific region. They do not extend far into the Sonoran, and are absent from the Lower Californian and the Mexican regions. They

have no representatives in equatorial America or the West Indies. A genus *Lystrophis* Cope¹, is found in subtropical and temperate South America, which resembles *Heterodon* superficially, but belongs to the Xenodontidæ. A genus occurs in Madagascar (*Anomalodon* Jan) which agrees superficially with *Lystrophis*, but differs in having an entire anal shield, but belongs by the penial characters to the Lycodontinæ.

The species of *Heterodon* have some peculiar habits which indicate greater intelligence than most other snakes possess. They throw themselves into remarkable contortions when alarmed, and expand their anterior ribs, inflate their lung, and open the mouth widely. They do not attempt to bite from the ground, but the long posterior maxillary tooth may be used with considerable effect if the snake is carelessly handled. The trowel-shaped rostral plate enables them to excavate sand with ease, and in such soil they are usually most abundant.

Three species of this genus may be distinguished as follows:

I. No accessory scales about the azygous plate.

Scales in 25 rows; rostral plate less developed; larger.....*H. platyrhinus*.

II. Accessory scales about the azygous scuta.

Scales in 25 rows; stouter, smaller; an inferior nasal plate; one row of lateral spots; belly white in adults.....*H. simus*.

Scales in 23 rows; smaller, more slender; no inferior nasal scuta; two rows of lateral spots; belly more or less black.....*H. nasicus*.

The *H. platyrhinus* ranges throughout the Eastern and Austroriparian regions, and the *H. simus* inhabits the Austroriparian only. The *H. nasicus* is divided into two subspecies, one of which extends over the Central and the other over the Sonoran regions.

HETERODON PLATYRHINUS Latreille.

Heterodon platyrhinus LATREILLE, Hist. Nat. des Reptiles, IV, 1800, p. 32, figs.

1-3.—HOLBROOK, N. Amer. Herp., II, 1828, p. 97, pl. XXI; 2d ed., IV, 1842, p. 67, pl. XVII.—DUMÉRIL and BIBRON, Erp. Gén., VIII, 1854, p. 765.—BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 51.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 43.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 154.

Coluber heterodon DAUDIN, Hist. Nat. Rept., VII, 1799, p. 153, pl. 60, fig. 28.—SAY, Amer. Journ. Sci. Arts., I, 1818, p. 261.—HARLAN, Journ. Acad. Nat. Sci. Phila., 1827, p. 357.

Coluber cacadæmon SHAW, Gen. Zool., III, 1802, p. 377, pl. 102.

Scytale niger DAUDIN, Hist. Nat. Rept., V, 1803, p. 342.—HARLAN, Journ. Acad. Nat. Sci. Phila., 1827, V, p. 367.

Pelias niger MERREM, Tentamen, 1820, p. 149.

Heterodon niger TROOST, Ann. Lyc. Nat. Hist., New York, III, 1836, p. 186.—HOLBROOK, N. Amer. Herp., IV, 1842, p. 63, pl. XVI.—BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 55.—DUMÉRIL and BIBRON, Erp. Gén., VII, p. 769.

Heterodon cognatus BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 54.

Heterodon atmodes BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 57.

Parietals and frontal longer than broad, about equal in length. Center of eye anterior. Dorsal rows twenty-five, all carinated, the

¹Bull. U. S. Nat. Mus., No. 32, 1887, p. 54.

outer sometimes smooth.. Scales on the back quite linear anteriorly; posteriorly they are much broader. Color yellowish gray, or brown, with about twenty-eight dark dorsal blotches from head to anus, and fifteen half rings on the tail. One or two lateral rows. Beneath yellowish. A dark band across the forehead in front of the vertical, continued through the eye to the angle of the mouth.

Frontal plate hexagonal, narrower behind; longer than broad; angles all distinct, lateral outlines straight. Prefrontal large, the lateral angle extending down to the loreal; the two prefrontals separated anteriorly by the azygos, or postrostral. Internasals smaller, entirely separated by the azygos. Rostral with the outline spherical angled, subacute at the apex, its upper surface compressed into a sharp ridge,

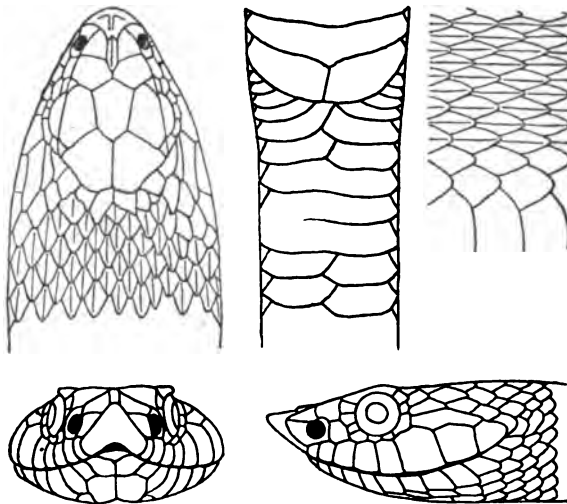


Fig. 165.

HETERODON PLATYRHINUS LATREILLE.

- 1.

Black specimen.

which, prolonged backward between the nasals and the prefrontals, connects with the azygos. This is linear, subpentagonal, acute-angled behind, where it wedges between the prefrontals. Superciliaries large. Scales behind the head distinctly carinated. Eye large. Line connecting tip of rostral with the postinferior corner of the last labial passes over the lower part of the eye. A triangular nasal, with the corners rounded, joined by its apex to the exterior angle of the prefrontals. No inferior nasal. Nostrils valvular, situated entirely in the posterior nasal, the anterior edge formed by the anterior nasal. Labials eight above; all higher than long, sixth largest, the third to the sixth in contact with the suborbitals; two large temporal shields above the three posterior labials. Temporals, three in the first row in eight specimens, 4-3 in one, and four on both sides in four. Center of the eye

anterior to the middle of the chord connecting the apex of rostral and posterior end of labials and over the middle of the fifth labial. Outline of upper jaw convex. Lower labials, eleven.

Body stout and short. Tail very short, and rapidly tapering, rather thicker than the thinnest part of the body. Dorsal rows twenty-five. Scales all distinctly carinated (including those on the back of the head), except the outer two or three rows, which are either perfectly smooth, or present very obsolete carination.

Color reddish brown above, with dark blotches. A series of twenty-eight quadrate, dorsal, uniform black blotches from head to anus, each from two to three scales long, and seven to nine wide, separated by regular brownish-yellow intervals of one and one-half to two scales. The blotches anteriorly are nearly square, posteriorly they are transversely elongated. Opposite the intervals, and, indeed, bounding them on either side, is a second series of small circular blotches on the fourth to the eighth lateral rows, and separated only by a narrow interval from the corner of the dorsal blotches. Sometimes there are faint traces of small blotches between the upper lateral series. Intervals between the lateral rows of blotches yellowish or reddish brown, darker than those on the back; outer dorsal rows greenish or yellowish white. On the tail there are fifteen black half rings, interrupted on the subcaudal scutellæ, the scales on the tail larger than on the greater part of the body. In young specimens there is distinctly visible a second series of still smaller blotches, below the one just mentioned, there being two of these opposite each one of the former, and placed on the second, third, and fourth exterior rows. Beneath greenish yellow, with obsolete greenish-brown blotches, indistinctly visible through the epidermis, sometimes more conspicuous in young specimens.

There is a transverse black or dark bar on the forehead, crossing the posterior half of the postfrontals, involving only the anterior edge of the vertical, and the anterior corners of the superciliaries. Behind this a dark patch, with its anterior margin a little back of the middle of the vertical, and involving the adjoining margin of the superciliaries and occipitals, together with the greater portion of the occipitals; sometimes with a light spot in the middle; the light space included between the two patches appears to extend continuously backward to the neck; above, a dark vitta from the back part of the orbit to the posterior labial, itself a continuation of the frontal vitta. An elongated narrow vertebral spot behind the junction of the occipitals, and generally isolated from them, on each side of which is a similar patch widening behind.

This species is subject to great variations of color. Sometimes the sides of the dorsal blotches pass insensibly into the ground color, so as to become transverse bands. At others they are light internally, with a narrow margin of black. Occasionally there is much black on the abdomen (in young specimens). The ground color varies from gray to

bright yellow, and sometimes even red. It may also happen that, by the confluence and extension of the darker margins, we have light bars on a dark ground, as on a specimen from the Scioto Valley, Ohio, where, with the other characters similar, the color is of a dark brown above and on the sides, with transversely quadrate brownish ash-colored spots along the back, some one and a half or two scales long, nine or ten wide, and at intervals of about three scales. Of these spots

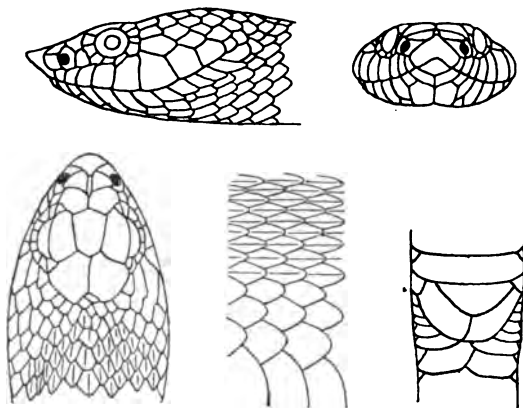


Fig. 166.

HETERODON PLATYRHINUS LATREILLE.

= 1.

where they form half rings, with intervals a little larger than themselves.

About forty specimens display the normal coloration. In eleven the lateral spots of the first row join the spots of the median row, inclosing the light intervening dorsal spaces as spots. In four other specimens this fusion is imperfect. The light spots have acquired so dark a shade as to have disappeared

in the black color variety, called by Dr. Holbrook *Heterodon niger*. Among numerous specimens of this form in the national collection there are two (Cat. Nos. 1168 and 9105) in which traces of the usual spots remain.

One specimen of this form is a true lead color, with a black band extending posterior to the orbit (Cat. No. 16489).

The specimens on which Baird and Girard proposed the name *Heterodon atmoides* differ from the normal form in a less production of the free acute edge of the rostral plate. No other character reenforces this peculiarity, and it intergrades with the usual type. It can be looked upon only as an individual characteristic. Individuals of this kind are more frequently sent from the eastern part of the Austroriparian region than elsewhere.

The specimen on which the *H. cognatus* (Cat. No. 1271; Indianola, Texas) was proposed by Baird and Girard is lighter colored than usual, but not otherwise different, except in the possession of only two temporals in the first row on each side. The absence of the small superior temporal is not by itself indicative of important diversity.

Baird and Girard give the following statistics of scuta and dimensions, the latter in inches:

Locality.	Gastrostegea.	Urostegea.	Scales.	Length.	Tail.
Carlisle, Pennsylvania.....	129+1.	53.	25.	28.	6
	123+1.	49.	25.	24½.	5
Clarke County, Virginia.....	143+1.	46.	25.	19.	2½
	127+1.	—	25.	11.	2
Scioto Valley, Ohio.....	148+1.	45.	25.	26.	4
Mississippi.....	135+1.	51.	25.	10.	1½
Indianola, Texas.....	130+1.	58.	23.	26.	6
	129+1.	51.	25.	11.	2
New Braunfels, Texas.....	124+1.	56.	25.	27.	6
Georgia.....	131+1.	56.	23.	25.	5½
Charleston, South Carolina.....	137+1.	54.	25.	12½.	1½
	141+1.	49.	25.	17.	2½
	137+1.	53.	23.	26.	4½
Carlisle, Pennsylvania.....	140+1.	49.	25.	36.	6
Abbeville, South Carolina.....	145+1.	—	25.	26.	—
Kemper County, Mississippi.....	126+1.	53.	25.	28.	5½

I find the caudal scutellæ to vary in number from thirty-nine to fifty-two in nine normally colored specimens, and from forty-two to fifty-six in five black specimens.

The *Heterodon platyrhinus*, when disturbed by man, throws itself into vigorous contortions, spreads the anterior ribs, and opens the mouth widely, after the manner of a venomous snake. If turned on its back and its abdomen be gently stroked, it will sometimes lie quietly in that position for a long time. I once observed the singular conduct of an individual which was kept in a cage with a water snake (*Natrix sipedon*) and a copperhead (*Ancistrodon contortrix*). Both of the harmless species were evidently greatly frightened on the introduction of the copperhead into the cage. The water snake sought the lowest spot in the sand on the bottom of the cage, and coiling up, kept close to the ground, not even raising his head. The *Heterodon*, on the contrary, inflated his long lung, swelling the greater part of his body into the form of a cylindrical bladder. He at the same time extended the anterior ribs, so that this part of his body resembled the thin blade of a paper cutter. He then plunged its nose into the sand and covered the top of his head with as large a pile of that substance as it would carry. In this disfigured condition he paraded slowly about the cage in front of the copperhead. The latter moved but little, and showed no disposition to provoke a quarrel with its singular companion.

Prof. O. P. Hay² has collected the following facts in regard to the breeding habits of *Heterodon platyrhinus*, the hog-nosed snake, viper, or spreading adder, as it is popularly known:

Dr. J. Schneck, of Mount Carmel, Illinois, reports³ that eighty-seven young spotted spreading adders were taken from the body of a wounded female. The author of the

¹ *Heterodon niger*.

² Proc. Ind. Acad. Sci., 1891, p. 114; Proc. U. S. Nat. Mus., XV, 1892, p. 393.

³ Amer. Nat., XVI, 1882, p. 1008.

note did not see this done, but got his information from persons who did see it. I am strongly inclined to believe that the reptile was a *Tropidonotus sipedon*. Another writer¹ in Pennsylvania gives an account of over one hundred young snakes issuing from a wound in the side of a female spreading adder. These young were each from 6 to 8 inches in length and all were active and blowing vigorously. Neither did the author of this note see the escape of the snakes, although he did see sixty-three of the young in alcohol. There may easily have been an error in the determination of the species to which these young snakes belonged. One who has examined the eggs of this species can not easily believe that so many young snakes could, with such readiness, escape from a wound in the mother's side. Moreover, these snakes deposit their eggs in the earth some time before the young are ready to lead an independent existence.

Dr. Bumpus² states that a female *Heterodon* in the National Museum brought forth 111 young, but Dr. Bumpus informs me that he did not himself observe this.

Prof. F. W. Cragin reports³ the finding, on September 10, of 22 eggs of this species; they were buried in the sand at East Hampton, Long Island. Two of the eggs which he had in his possession hatched four days afterwards. Troost appears to have dissected a black specimen, in which he found 25 eggs. Dr. C. C. Abbott says⁴ that he has frequently in May found the eggs of the hog-nosed snake in considerable numbers a few inches below the surface of the ground, and in early July he once found a family of 17 very small and apparently just hatched young. These resented all interference, snapped, hissed, and flattened their heads precisely as an older snake would do. The size of the young is not given, but on another page (p. 295) he implies that they were less than 4 inches in length. I think that this species, like most other species, produce their young rather late in the season, but I see no reason for not believing that some individuals may bear their eggs over the winter and lay them in the spring.

A female (Cat.No. 17951, U.S.N.M.), sent me from Veedersburg, Fountain County, Indiana, contained 15 eggs, the posterior 4 of which lay in the left oviduct. I could discover no signs of embryos. Each egg was covered by a thick, tough, yellowish coat, inside of which was a thinner and more delicate membrane.

Through the kindness of Dr. L. Stejneger, curator of the department of reptiles in the National Museum, I have been enabled to make some observations on the eggs and living young of this *Heterodon*. On the 31st day of last August there were brought into the laboratory of the department from some point in Maryland not far from Washington a lot of 27 eggs, which the finder said were the eggs of the copperhead. It was reported that the eggs were thrown up out of the ground by the plow, and that the mother snake was near by and had resented the disturbing of her treasures. She had been killed, but had not been sent along with the eggs. Since it was supposed that the copperhead produces living young, the occupants of the laboratory were anxious to learn if this opinion were erroneous. Accordingly one of the eggs was opened, and in it was found a young hog-nosed snake, fully developed and ready to assist himself on the scene of action. This *Heterodon* quite closely resembles the copperhead, and most people are not accustomed to make nice distinctions among snakes. This close resemblance may account for some of the statements of the large number of young produced by the copperheads.⁵

The eggs referred to were between $1\frac{1}{4}$ and $1\frac{1}{2}$ inches long and about seven-eighths inch in short diameter. The egg covering was thick, tough, and flexible, resembling a piece of parchment. There is little if any deposit of lime in it. Of these eggs, some were found to have hatched during the night of September 6; others, which were buried somewhat deeper in some clay, escaped from the eggs later, but all were out by the afternoon of the 8th. The length of such as were measured varied

¹ Amer. Nat., III, 1869, p. 555.

² Riverside Natural Hist., III, p. 364.

³ Amer. Nat., XIII, 1879, p. 710.

⁴ A Naturalist's Rambles about Home, p. 289.

⁵ Amer. Nat., XVII, 1883, p. 1235.

between 7 and 8 inches. From the moment of escape from the egg all were quite active, and manifested many of the characteristics of the adults. Some of the little fellows were quite saucy, and would make a pretense of striking at the approaching finger, but their efforts in that line were rather feeble. A faint hiss was sometimes uttered, but that may not have been voluntary. One would sometimes flatten its head and body and rear up with the anterior third of its length free from the ground. If one did not know well their inoffensive natures, one would be excused for fearing to handle them. An extremely singular habit possessed by the adults is that of feigning death. On being struck or teased, they will roll over and over, as if in the intensest agony, and then throw themselves on the back, and lie there as if dead. Out of some fifteen of the young experimented with, I succeeded in getting only two or three to go through with this performance, but these did it to perfection. On being lightly struck a few times, they would turn over on the back, writhe about a while, and then lie perfectly still. If turned right side up they would again turn on the back. If left undisturbed for a little while they would turn over and creep slyly away. The others of the young would not act in this way, however much they were teased. It would be interesting to know whether all the adults possess this odd habit, or only a portion of them.

The cuticle of the young *Heterodons* is shed very shortly after their escape from the egg coverings. Within a few minutes after one had left its prison the skin was observed to be broken about its head. It had left the egg at half past 1 and by 4 o'clock the skin was pushed back half the length of the body. The next morning the skin was wholly shed, revealing the brighter colors of the new skin. While getting rid of the cuticle the little fellow kept crawling over the clay and among the roots of the grass.

The opportunity was embraced to observe the use which is made of the egg tooth. The tooth itself is easily seen in the just hatched snake. Its lateral borders are more nearly parallel than those of the tooth of *Bacantion* figured by Weinland. Seen from the side, the anterior or upper outline is concave, the posterior outline convex. Thus the tooth projects forward and is slightly turned up. The anterior face is also concave from side to side, so that there is, on each side, a distinct cutting edge. The tip is cut off square. The tooth appears to have a ligamentous attachment, and may be lifted a little, but not much depressed. It seems quite evident that the tooth is first engaged in the egg covering, and then made to do its work by a forward push of the head. An examination of the covering, after the snake had left it, gives ample proof that it has been cut and not merely torn. The edges are as smooth as if they had been slashed with a razor. A long slit is sometimes made as if by a single effort. In other cases several attempts appear to have been made before the covering has been open enough for the snake to get out. In one or two cases a tooth has not been inserted deeply enough, and the only result was a scratch on the inside of the covering. The egg tooth having performed its office becomes loose and drops out. This occurs usually within twenty-four hours.

When the slit has been successfully made, the little snake may sometimes be seen pushing its head carefully out as if to survey the surroundings. Should there be any movement, the head will be quickly withdrawn.

I have been able to collect some facts concerning the pairing of the sexes of *Heterodon platirhinos*. Prof. U. O. Cox, of Mankato, Minnesota, informs me that he found two individuals uniting some time in May. A second male was entwined with the two other snakes. The latter were separated with difficulty. The male intromittent organs are described as being of an oval form, an inch long, and over half an inch thick.

Two observers have seen black specimens, formerly called *H. niger*, pairing with the spotted individuals. Prof. W. S. Blatchley¹ found a black and a spotted one copulating on April 19. He speaks in a letter to me of the intromittent organs as

¹ Journ. Cin. Nat. Hist. Soc., 1891, p. 33.

being as large as walnuts and covered with spines. Mr. E. R. Quick, of Brookville, Indiana, an accurate observer of nature, writes to me that he once found a black viper pairing with a spotted one. The time, he thinks, was late in June. The time of gestation of this species is not known. It may continue from spring until autumn. Possibly the late-pairing individuals may retain their eggs until the next spring. Nor do we know how long the eggs are laid before they are ready to hatch. These matters are known concerning very few of our snakes, and a wide field is offered for work and observation.

Heterodon platyrhinus Latreille.

SPOTTED FORM.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
426	1	Virginia.....	.....	Dr. C. B. R. Kennerly....	Alcoholic type.
1162	1	Carlisle, Pennsylvania.....	.....	Prof. S. F. Baird.....	do.
8027	1	Vineland, New Jersey.....	.....	Mrs. Mary Treat.....	do.
5036	1	Micanopy, Florida.....	.....	Dr. T. H. Bean.....	do.
1160	1	Calcasieu Pass, Louisiana.....	.....	G. Wurdemann.....	do.
1201	1	Mississippi.....	.....	Dr. B. F. Shumard.....	do.
1199	1	Charleston, South Carolina.....	.....	Prof. R. Owen.....	do.
6066	1	Fort Riley, Kansas.....	.....	Dr. Jarvis, U. S. A.....	do.
1189	1	Tyree Springs, Tennessee.....	.....	Prof. R. Owen.....	do.
5480	1	Independence, Missouri.....	.....	Dr. J. G. Cooper.....	do.
1264	1	Fort Snelling, Minnesota.....	.....	Dr. Geo. Suckley, U. S. A.....	do.
7265	1	Eutaw, Alabama.....	.....	.....	do.
8765	3	Belleville, Illinois.....	Sept. —, 1874	Dr. A. Reuss.....	do.
4815	1	Southern Illinois.....	.....	R. Kennicott.....	do.
7256	1	Washington, District of Columbia.....	.....	.....	do.
1266	1	San Pedro, Texas.....	.....	Dr. S. W. Woodhouse.....	do.
1130	1	Marietta, Ohio.....	.....	Prof. A. Winchell.....	do.
1244	1	Texas.....	.....	.....	do.
1210	1	Charleston, South Carolina.....	.....	.....	do.
4769	2	Fort Riley, Kansas.....	.....	H. Brandt.....	do.
6446	1	 do.....	.....	.....	do.
7117	1	Wilmington, North Carolina.....	.....	.....	do.
10599	1	Nashville, Tennessee.....	Aug. 3, 1880	William J. Taylor.....	do.
10327	2	Laurel, Maryland.....	July 1, 1879	George Marshall.....	do.
10477	1	Gainesville, Florida.....	July —, 1880	James Ball.....	do.
11426	11	Laurel, Maryland.....	.....	.....	Eggs, alcoholic.
9756	1	 do.....	June 3, 1878	Henry Marshall.....	Alcoholic.
12042	3	Mount Carmel, Illinois.....	Nov. —, 1881	L. M. Turner.....	do.
8355	1	Goldsbrough, North Carolina.....	.....	H. W. Welsher.....	do.
9623	1	Statesville, North Carolina.....	Nov. —, 1877	A. L. Barringer.....	Cast.
9756	1	Laurel, Maryland.....	June 3, 1881	H. Marshall.....	do.
13983	1	Brightwood, District of Columbia.....	.....	.....	.....
14630	1	Virginia.....	.....	J. H. Kuehling.....	Alcoholic.
14506	1	Coast of North Carolina.....	.....	Captain Evans.....	do.
15239	1	District of Columbia.....	.....	H. W. Henshaw.....	do.
15550	1	Cook County, Texas.....	.....	G. H. Ragsdale.....	do.
15562	1	San Diego, Texas.....	.....	W. Taylor.....	do.
16435	1	District of Columbia.....	.....	A. Brown.....	do.
17124	1	Takoma Park, District of Columbia.....	.....	Dr. R. W. Shufeldt.....	do.
17470	1	Glasgow, Kentucky.....	.....	W. T. Owaley.....	do.
17332	1	Laurel, Maryland.....	.....	C. W. Richmond.....	do.
17464	1	St. Georges Island, Maryland.....	.....	J. D. Figgins.....	do.
17392	1	Eastland, Texas.....	.....	C. W. Richmond.....	do.
17569	1	Scarboro, New York.....	.....	A. H. Thayer.....	do.
17816	1	Mount Vernon, Alabama.....	.....	Dr. R. W. Shufeldt.....	do.
17951	1	Veedersburg, Indiana.....	.....	Dr. O. P. Hay.....	do.
1153	1	Charleston, South Carolina.....	.....	Dr. S. B. Barker.....	do.
1184	2	Somerville, North Carolina.....	— —, 1854	J. C. McNair.....	do.
8364	1	Kinston, North Carolina.....	.....	J. W. Milner.....	do.
4836	1	Brookville, Iowa.....	.....	Dr. W. A. Hammond, U. S. A.....	do.

Heterodon platyrhinus Latreille—Continued.

SPOTTED FORM—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
9003	1	St. Johns River, Florida ..	— —, 1874	G. Brown Goode	do.
9099	1	Arlington, Florida .....	.....	do	do.
1265	1	Yellowstone River	— —, 1856	Lieut. G. Warren, U.S.A. ..	do.
19270	5	Cloppers, Maryland .....	.....	W. Caulfield	do.
19979	1	Eustla, Alabama .....	.....	Theo. Holm	do.
20961	1	Mount Vernon, Virginia ..	.....	Edw. Green	do.
13643	2	Georgiana, Florida .....	.....	W. Wittfield	do.
14016	1	Wheatland, Indiana .....	.....	R. Ridgway	do.
17331	1	Washington, District of Columbia ..	.....	C. W. Richmond	do.
13530	1	Olney, Illinois .....	.....	J. and C. H. Walker	do.
18010	1	Cabin John, Maryland .....	.....	P. Leonhard	do.
16488	1	St. Louis, Missouri .....	.....	J. Hurter	do.
19858	3	North America .....	.....	Hallett Phillips	do.
19859	1	District of Columbia .....	.....	R. W. Brown	do.
19860	1	District of Columbia .....	.....	R. W. Brown	do.
20655	1	District of Columbia .....	.....	R. W. Brown	do.

BLACK FORM.

1171	1	Kemper County, Missis- sippi .....	.....	D. C. Lloyd	Alcoholic type.
1172	1	Carlisle, Pennsylvania .....	.....	Prof. S. F. Baird	do.
8766	2	Belleville, Illinois	Sept. —, 1874	Dr. A. Reuss	do.
7261	1	Abbeville, South Carolina ..	.....	Dr. J. B. Barratt	do.
1168	1	Pensacola, Florida	— —, 1857	Dr. Wm. A. Hammond, U. S. A.	do.
1206	1	Eutaw, Alabama .....	.....	Prof. A. Winchell	do.
1165	1	Liberty County, Georgia ..	.....	Dr. W. L. Jones	do.
1311	1	Rio Pecos, Texas .....	.....	Capt. John Pope, U. S. A. ..	do.
1186	1	Anderson, South Carolina ..	.....	Mrs. M. E. Daniel	do.
9105	1	Fort Mason, North Caro- lina .....	.....	Dr. Weyrick	do.
9112	1	Wilmington, North Caro- lina .....	.....	.....	do.
12041	1	Mount Carmel, Illinois ..	Nov. —, 1881	L. M. Turner	do.
9031	1	Stateville, North Carolina ..	June —, 1877	A. L. Barringer	Cast.
13475	1	Alapaha, Georgia .....	.....	W. J. Taylor	do.
17964	1	Mississippi .....	.....	Dr. O. P. Hay	do.
18020	1	Umatilla, Florida .....	.....	C. L. Hopkins	do.
16489	1	St. Louis, Missouri .....	.....	J. Hurter	do.
14754	1	Soldiers' Home, District of Columbia .....	.....	Conway Robinson, jr.	do.
14827	1	Georgiana, Florida .....	.....	William Wittfield	do.
14834	1	Hillsboro, Virginia .....	.....	Geo. W. Shutt	do.
15239	1	District of Columbia .....	.....	H. W. Henshaw	do.
15350	1	Cook County, Texas .....	.....	G. H. Ragdale	do.
15662	1	San Diego, Texas .....	.....	William Taylor	do.
16488-9	1	St. Louis, Missouri .....	.....	Julius Hurter	do.
17124	1	Takoma Park, District of Columbia .....	.....	Dr. R. W. Shufeldt	do.
17333	1	Bladensburg, Maryland ..	.....	C. W. Richmond	do.
17464	1	St. Georges Island, Mary- land .....	.....	J. D. Figgins	do.
17470	1	Glasgow, Kentucky .....	.....	Dr. W. T. Owsley	do.
17580	1	Scarboro, New York .....	.....	A. H. Thayer	do.
17638	1	Linden, Maryland .....	.....	N. P. Scudder	do.
17951	1	Veederburg, Fountain County, Indiana .....	.....	Dr. O. P. Hay	do.
17964	1	Mississippi .....	.....	do	do.
18010	1	Cabin John postoffice, Maryland .....	.....	Peter Leonhardt	do.
18020-22	1	Umatilla, Lake County Florida .....	.....	C. L. Hopkins	do.
19619	1	Mount Vernon, Virginia ..	.....	J. H. Kuehling	do.
19679	1	Eustla, Florida .....	.....	U. S. Fish Commission ..	do.
21132	1	Wildwood, Georgia .....	.....	do	do.

HETERODON SIMUS Linnaeus.

Heterodon simus HOLBROOK, N. Amer. Herpt., IV, 1842, p. 57, pl. xv.—BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 59.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 43.

Coluber simus LINNÆUS, Syst. Nat., 12th ed., I, 1766, p. 216.—GMELIN, Linnæus Syst. Nat., 13th ed., I, Pt. 3, 1788, p. 1086.

Heterodon platyrhinus SCHLEGEL, Ess. Phys. Serp., 1837, p. 97, pl. III, figs. 20, 22.

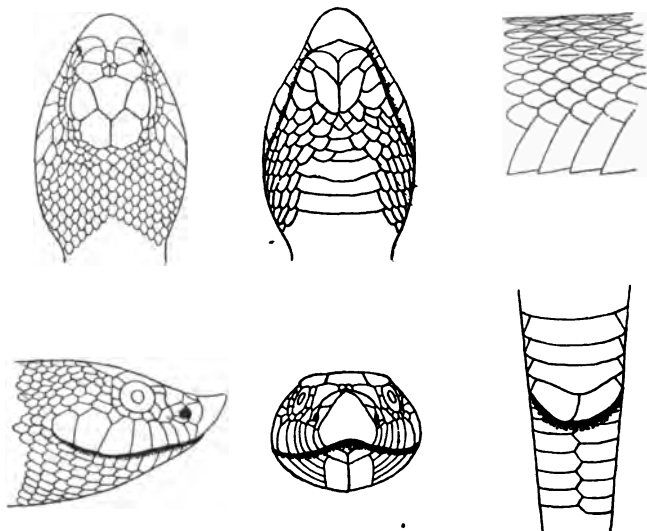


Fig. 167.

HETERODON SIMUS LINNÆUS.

= 1.

Abbeville, South Carolina.

Cat. No. 1197, U.S.N.M.

Frontal plate as broad as long, generally longer than the parietals. Rostral broad and high. Azygos encircled by three to five small plates. Mouth very short. Dorsal rows twenty-five, the three or four externals smooth. Dorsal series of thirty-five blotches, with one alternating series on each side. Abdomen yellowish, scarcely maculated. A narrow black band across the forehead in front of the frontal and passing through the eye across one labial to the angle of the mouth.

Frontal plate subheptagonal, sometimes nearly triangular; with three sides anteriorly, the lateral against the prefrontals, the middle against the azygous plates, the sides very obtusely angled. Superciliaries rather short, broad. Parietals very short, almost as long as broad. Prefrontals moderate, the exterior angle scarcely reaching the angle of the loreal; the two separated by three small plates posterior to the azygos. Internasals not much smaller. Azygous plate resting anteriorly against the rostral and touched by the inner angle of the internasal. There is a small plate on each side, between it and the notch at the junction of the anterior and prefrontals, while behind, the space between it, the

prefrontals, and the frontal is occupied by the three small plates already mentioned. This azygos is thus surrounded on the sides and posteriorly by three small plates (this number is sometimes greater). Rostral broad and high, much recurved. Eyes moderate, situated posterior to the center of imaginary line connecting the last labial and rostral, which would pass nearly through its center. Loreal subtriangular, acute above, scarcely reaching to the exterior angle of the postfrontal, a small plate sometimes intervening. Nasal plates rather short and high; nostril occupying most of the posterior one, its infero-anterior wall constituted by the first labial, its lower by a small inferior nasal plate. Labials eight above; in one specimen of the six examined, there are seven; they increase very rapidly from the diminutive first; fifth and sixth largest; all much higher than broad. Lower labials nine. Curve of upper jaw very convex and short. Temporals four on both sides in five specimens; three on both sides in one.

Scales back of the head short, curved, obsoletely carinated. Dorsal rows of scales twenty-five, outer rows smooth, sometimes only three, the carination slight, increasing to the medial row. Scales shorter and broader than in the other type, becoming narrower on the back; those behind rather narrower than before. Body contracted at the anus, then expanding or swelling on the tail, which is thick throughout, tapering to the tip. Scales on the tail longer and broader than those of the upper part of the body in front; carination not very distinct, inferior three rows truncated behind, especially the highest.

A dorsal series of transverse black blotches, thirty-five from head to tip of tail, the twenty-seventh opposite the anus. These are sometimes oblique, but generally transverse, and with the anterior and posterior margins parallel. They are about nine scales wide and three to four long, with light-brownish yellow intervals one or one and a half scales wide. On each side and opposite the intervals is a distinct series of subquadrate or circular black spots on the sixth to ninth rows, not touching those on the back, and between them a dusky shade opposite the dorsal spots. Below these again are usually two smaller blotches to each spot. Intervals between the spots mottled yellowish-brown. Beneath yellowish, with obsolete small brown blotches. On the tail there are nine half-rings rather wider than the light intervals and somewhat contracted above.

A narrow black line crosses the forehead on the posterior half of the prefrontals, and just margining the frontal; this passes through the center of the eye and is continued to the posterior labial. A medial patch of black, expanding behind, starts from the commissure of the parietals, from which plates others, one on each side, pass across the angle of the jaws, the three confluent with the dark color in the parietals. In *H. platyrhinus* this medial patch is isolated and not in contact with the occipital one.

Some specimens from Abbeville, South Carolina, vary in having the

rostral separated from the prefrontals by two or three small plates, and the azygos entirely cut off from the internasals by intervening plates. The lower wall of the nostril is constituted by two small plates; there is a second small plate above the loreal; in fact, a general tendency to break up into small plates. The markings on the back are restricted to a dorsal series, with a dusky shade opposite, and a lateral series opposite the light yellowish intervals; the ground color of the sides a quite uniform yellowish-brown. Specimens from Mississippi have the dorsal spot smaller and nearly circular.

This is the most robust and the shortest species of the genus. Its range is the Austroriparian region, omitting western Texas, where the *H. nasicus* replaces it.

Heterodon simus Linnaeus.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1197	1	Abbeville, South Carolina..	Dr. J. B. Barrett	Alcohol.
4834	2	Brookville, Indiana	Dr. R. Haymond	do.
10447	1	Gainesville, Florida	Jas. Bell	do.
10691	1	do	do	do.
8355	2	Goldsboro, North Carolina..	H. W. Wilsher	do.
6399	1	do	do	do.

HETERODON NASICUS Baird and Girard.

Heterodon nasicus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 61.

Heterodon simus nasicus COPE, Check-list N. Amer. Batr. Rept., 1875, p. 43.

Frontal and parietal scuta usually wider than long, the parietals often shorter than the frontal. Head short; rostral plate very large and strongly recurved. No inferior nasal plate cut off from the post-nasal. Two or more loreals. Inferior labials eight, all much higher than long. First row of temporals generally four. From three to twenty-four accessory scales beside and behind the azygous plate. Scales in twenty-three rows, all keeled except the first three on each side. Proportions of body more slender than in *H. simus*.

Color light yellowish-gray above, with a medium dorsal series of rather closely placed brown spots and with two alternating series of brown spots on each side. Three brown short longitudinal nuchal brown bands and a brown band from each eye posteriorly. Belly either entirely black or tessellated with black and white.

This is the Western representative of the *H. simus*, to which it is nearly allied. It can be always distinguished, however, especially in its typical subspecies, by the characters given. A single specimen out of the many in the U. S. National Museum (Cat. No. 4961) from Texas displays an inferior nasal plate.

Two forms of the *H. nasicus* inhabit different regions and may be regarded as subspecies.

Scales accessory to azygous plate two or three; loreal small or wanting; belly black and white spotted *H. n. kennerlyi*.

Scales accessory to azygous plate from eight to twenty-four; loreals generally two; belly nearly entirely black.....*H. n. nasicus*.

In the *H. n. kennerlyi* in three out of six specimens the parietal scuta are shorter than the frontal. In sixteen of the *H. n. nasicus*, ten specimens have the parietals shorter than the frontal. In the small number of accessory scales the *H. n. kennerlyi* approaches nearer the *H. simus* than does the *H. n. nasicus*. The same affinity is indicated by the smaller amount of black on the belly. It represents the genus in the Sonoran region, while the *H. n. nasicus* occupies the Central.

HETERODON NASICUS KENNERLYI Kennicott.

Heterodon kennerlyi KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 336.

Heterodon simus kennerlyi COUES and YARROW, Herp. Dak. and Mont. in Bull. U. S. Geol. Surv. Terrs., IV, 1878, p. 271.—JAN, Icon. Gen. Ophid., Pt. 10, pl. v, fig. 2.

Head broad, very short anteriorly. Rostral plate very large. Loreal plate very small, sometimes absent. Only two supplemental plates behind azygos; the latter is sometimes replaced by two symmetrical contiguous plates and without any supplemental. The internasal and prefrontal in contact with the posterior process of the rostral. Dorsal row of scales twenty-three, all carinated except the first and second, which are perfectly smooth. Ground color light yellowish-gray; a dorsal series of rather indistinct rounded or subquadrate brown blotches; a second series of smaller circular spots much darker and more distinct; below this a third and more indistinct series.

In its general form and appearance this resembles the *Heterodon nasicus nasicus*, with which it is sometimes found associated. The body, however, is rather shorter and thicker than in that form, and the head is broader, with the part of the head anterior to the eye decidedly shorter. The nasals are not as well developed longitudinally as in *H. n. nasicus*, but the result of this shortness of the anterior part of the head is seen in the very small loreal, which is frequently wanting entirely. There is never more than one loreal, while frequently two are seen in *H. n. nasicus*, in which the loreal is in every case strikingly larger than in *H. n. kennerlyi*. The most striking difference in these species is in the number of small plates surrounding the azygos, or postrostral. While in *H. n. nasicus* there are always at least ten of these, one or two of which margin the inner edges of the prenasals and prefrontals, there are never more than two, and frequently but one, additional plate in *H. n. kennerlyi*, and the prenasal and prefrontal are always in contact with the posterior process of the rostral. The azygos is short, nearly as broad as long, and usually there are just behind it two contiguous plates of about the same size separating it from the postfrontal, but not from the prefrontal. Frequently, however, the azygos is longitudinally divided and without any additional plates, but in contact with the rostral anteriorly and the vertical posteriorly, and not separated from the postfrontals. The frontal parietals, superciliaries, and labials are much as in *H. n. nasicus*, though generally less developed longitudinally. The rostral is as large as in *H. n. nasicus*.

The two outer dorsal rows are both perfectly smooth; in *H. n. nasicus* the second is distinctly though delicately carinate.

The ground color is light yellowish grey, with a dorsal series of rather indistinct subquadrate or rounded blotches, two to two and a half scales long, and separated by intervals of one or two scales, rather wider anteriorly. Below this is a series of very distinct purplish black circular blotches, covering four scales transversely and two longitudinally; below this one or more indistinct series of spots. This pattern of coloration is very similar to that of *H. n. nasicus*, but the ground color is always lighter and less distinct. The upper lateral series is of a purplish black, and much more distinct, forming a prominent character.

Abdomen nearly entirely black, except a few yellow scuta. The head is marked as in *H. n. nasicus* except that the nasals, prefrontals, and rostral are all yellowish, while in the latter species they are dark in front of the light transverse line which crosses the crown behind the rostral; and in *H. n. kennerlyi* the light line across the superciliaries and vertical is much broader than in *H. n. nasicus*. This species differs from *H. n. simus* in many of the same features as does *H. n. nasicus*. These, together with the small or absent loreal and small number of supplemental plates, readily distinguish it.

Heterodon nasicus kennerlyi Kennicott.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1282	2	Matamoras, Mexico.....	.....	Lieutenant Couch, U.S.A.	Alcoholic type.
7290	1	Lower Rio Grande.....	.....	A. Schott.....	do.
5185	1	Fort Stockton, Texas.....	.....	Patrick Duffy.....	do.
8878	1	Southern Arizona.....	—, 1873	H. W. Henshaw.....	do.
8413	1	do.....	Oct. —, 1874	do.....	do.
10202	1	White River Cañon, Arizona.	—, 1879	Dr. K. T. Burr.....	do.

HETERODON NASICUS NASICUS Baird and Girard.

Heterodon nasicus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serps., 1853, p. 61.—JAN, Icon. Gen. Ophid., Pt. 10, pl. v, fig. 1.

Heterodon simus nasicus COPE, Check-list N. Amer. Batr. Rept., 1875, p. 43.

Frontal broader than long. Rostral excessively broad and high. Azygous plate surrounded behind and on the sides by many small plates (9–24). A second loreal. Labials short and excessively high. Dorsal rows of scales twenty-three, exterior alone smooth. A dorsal series of about fifty blotches, with four or five others on each side. Body beneath black. A narrow white line across the middle of the superciliaries; a second behind the rostral. A broad dark patch from the eye to the angle of the mouth, crossing the last two labials.

Frontal plate very broad, subhexagonal. Parietals short. Rostral very broad, high, more than in the other species, outline rounded. The interval between the opposite frontals, the rostral, and the frontal occupied by a number of small plates, from nine to twenty-five, arranged

with symmetry on each side and behind the small azygos. The base of the rostral between the opposite anterior nasals is generally margined by these small plates, which sometimes, too, are seen between the frontal and the anterior portion of the superciliaries. This crowding of plates causes the anterior part of the forehead to be broader than in *H. n. simus*. Eye small, its center rather posterior to the middle of the imaginary line connecting the tip of rostral with the lower angle of the postlabial, which line scarcely crosses the eyeball. Orbital plates, ten to thirteen in number. Loreal triangular, rather longer than high, separated from the prefrontal by a small second loreal above it. Nasals rather short, postnasal bounding the lower part of the nostril. Labials

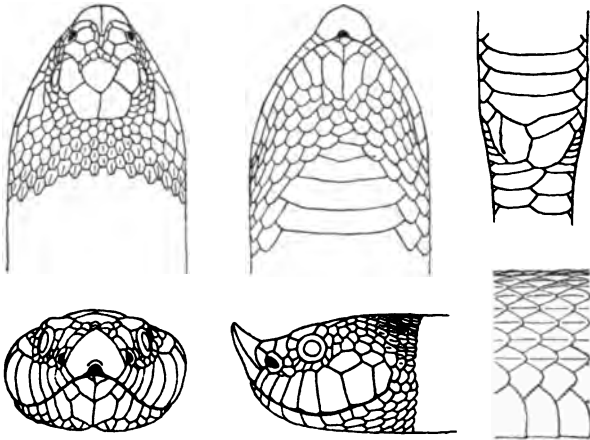


FIG. 168.

HETERODON NASICUS NASICUS BAIRD AND GIRARD.

= 1.

South Dakota.

Collection of E. D. Cope.

eight above, all of them higher than long; indeed, their vertical extension is much greater than in any other species; the sixth highest, center of eye over the junction of the fifth and sixth.

Dorsal rows of scales twenty-three, outer row smooth, rest all distinctly carinated, the keels extending to the ends of the scales; those just behind the parietal plates truncated, with obsolete carinae. Scales on the hind part of the body rather broader and shorter than anteriorly; the inequality scarcely evident in large specimens.

Ground color light brown or yellowish gray, with about fifty dorsal blotches from head to tip of tail; the thirty-ninth opposite the anus. These blotches are quite small, rather longer transversely, subquadrate, or rounded, indistinctly margined with black, (obsoletely on the outside); they cover seven to nine scales across, are two to two and

can districts. They are snakes of fragile structure, inhabitants of brush, with feeble dentition. The head has the appearance of that of a foetal snake, with the short nose and large eye. They are said by Duméril and Bibron to live on Mollusca. Their immense tracheal lung distinguishes them from the Dromicinæ, which they resemble in penial characters.

The hemipenis in *Leptognathus* is not bifurcate, but the sulcus is deeply so. It is calyculate from the bifurcation of the sulcus to the extremity, and the calyces are fringed. Below them the organ is furnished with hooked spines halfway to the base. Below them the surface is smooth.

COLUBRINÆ.

This subfamily includes representatives of the Calamarinæ, Coronellinæ, Lycondontinæ, Colubrinæ, and Dryadinæ of authors, and includes burrowing, ground, and arboreal types. The group is especially characteristic of Palearctica and Nearctica, but numerous forms occur also in the Oriental, Ethiopian, and Neotropical realms. There is a general similarity in penial structure, the diversities being of minor importance and some of them not yet fully understood. I have been able to abolish the division Coronellinæ, which never had any real standing, and also to show that Hallowell was right when he referred the *Lycodon rufozonatus* of authors to the neighborhood of *Coronella*. The genera of burrowing habits and generally small size, which were variously referred to the Calamarinæ and Coronellinæ, generally have the rucking of the hemipenis reduced and replaced by spines. This is conspicuous in *Stylasonia*, and especially in *Conopsis*, where there is but one row of calyces, and in *Adelphicus* and *Trimetopon*, where the cups are replaced by unossified papillæ.

In the typical species of *Ophibolus* the calyces are much reduced in number and replaced by spines. Some genera have the borders of the calyces conspicuously papillose, while in others they are smooth, but intermediate conditions connect them. In some forms there are smooth patches on the apex of the organ, but the value of this character is uncertain. In *Cynophis* I have found a remarkable apical awn, but as I have had the opportunity of examining but one individual, I am not sure how constant it is. In the *Tropidoclonium lineatum*, where a similar character is present, I have found it to be entirely constant. I give the following synopsis of the genera which I have been able to examine:

I. Hypapophyses not piercing œsophagus.

* Apical calyces of hemipenis present.

A. The calyces not furnished with spines, excepting the inferior marginal ones.

α No apical awn or papilla.

β Not capitate.

γ Calyces very large, few, and shallow.

Isodont; colubriform; anal divided..... *Caococalyx* Cope.¹

¹ Type, *Drymobius percarinatus* Cope; Costa Rica.

- γγ. Calyces numerous, or when few replaced by spines.
- δ. Calyces mingled with large pockets.
Isodont; attenuate.....*Dendrophis* Boie.
- δδ. Calyces without large pockets.
- ε. Rostral normal or compressed; pupil round.
- ζ. Anterior teeth not larger than posterior.
- η. Two median rows of scales.
Colubriform; isodont.....*Herpetodryas*¹ Boie.
- ηη. One median row of scales.
- θ. Trachea enormously expanded transversely.
Subisodont; attenuate.....*Thrasops* Hallowell.
- θθ. Trachea normal.
- ι. Calyces numerous; fringed.
- κ. One nasal plate.
Isodont; colubriform; anal divided...*Cyolophis* Günther.
Isodont; coronelliiform; anal divided.
Contia Baird and Girard.
- κκ. Two nasal plates.
Anal divided; no epiglottis; attenuate; a loreal.
Leptophis Bell.
As *Leptophis*, but no loreal.....*Hapsidophrys* Fischer.
Anal divided; no epiglottis; colubriform; a loreal.
Coluber Linnaeus.
As *Coluber*, but anal entire.....*Spilotes* Wagler.
As *Spilotes*, but an epiglottis.....*Epiglottophis* Cope.
As *Spilotes*, but rostral prominent and compressed.
Rhinocelis Wagler.
Anal entire; plates normal; coronelliiform.
Oscola Baird and Girard.
Anal entire; rostral prominent, produced backwards;
four prefrontals; an epiglottis.....*Pityophis* Holbrook.
- ιι. Calyces numerous; not fringed.
Attenuate, dipsadiform; isodont.....*Bucephalus* A. Smith.
Coronelliiform; anal divided; one scale-pit.
Coronella Laurenti.
Coronelliiform; anal divided; two scale-pits.
Proterodon Hallowell.
Colubriform; anal divided; internasal and nasal united.
Symphimus Cope.
- ιιι. Calyces few; apical.
Subisodont; coronelliiform; two nasals; a loreal; anal
entire.....*Ophibolus* Baird and Girard.
Isodont; fusiform; one nasal; no loreal; anal entire.
Stylosoma Brown.
- ζζ. Anterior teeth longer than posterior.
Coronelliiform; pupil erect; calyces not fringed.
Dinodon Duméril and Bibron.
- εε. Rostral plate produced or recurved.
- ζ. Rostral not free laterally; pupil round.
- η. Subcaudals one-rowed.
Internasals distinct; calyces few.*Rhinocelis* Baird and Girard.
- ηη. Subcaudals two-rowed.
- θ. Internasals fused with nasals.
Fusiform; isodont; rostral depressed; calyces fringed.
Chilomeniscus Cope.

¹ *Zaocys* Cope is apparently allied to this genus, but I do not know the penial structure.

66. Internasals not fused with nasals.
 Rostral trihedral; internasals present; anal entire; calyces not fringed..... *Cemophora* Cope.
 Rostral recurved; no internasals; calyces numerous, fringed; anal divided..... *Ficimia* Gray.
 Like *Ficimia*, but internasals present, separated by rostral. *Gyalopium* Cope.
 Rostral not recurved; nasals distinct from labials; calyces numerous..... *Geagras*¹ Cope.
 Rostral not recurved; nasals distinct from labials; calyces very few..... *Conopsis* Günther.
55. Rostral plate free laterally; pupil erect.
 Colubriform, subisodont..... *Phyllorhynchus* Stejneger.
- ββ. Hemipenis capitate.
 Pupil round; rostral free laterally..... *Salvadora* Baird and Girard.
 Pupil erect; rostral normal..... *Hypsiglena* Cope.
- αα. An awn-like apical papilla.
 Colubriform; scuta normal..... *Cynophis* Gray.
- AA. Calyces with the borders spinous.
 Colubriform; isodont; scuta normal..... *Gonyosoma* Wagler.
- AAA. Calyces with spines on the internal walls.
 Calyces numerous, fringed; scuta normal; one nasal plate... *Entacanthus*² Cope.
- ** Calyces split up into papillæ.
 A preocular; one prefrontal..... *Trimelopon* Cope.
 No preocular; two prefrontals..... *Adelphicus* Jan.
- II. Anterior hypapophyses piercing the walls of the oesophagus.
 α. Spines in transverse or frowncd rows.
 Calyces numerous, fringed; scuta normal; one nasal; dipsadiform. *Dasyptis* Wagler.

This subfamily includes the ground snakes which are characteristic of the two great northern land areas, Eurasia and North America, but numerous species occur in the regions to the southward, especially in the Oriental and Neotropical realms. The dentition is isodont or coryphodont, between which no line of demarcation exists, although a few forms (*Zamenis* for example) present in some of the species the diacranterian type. In a few (for example, *Dinodon*) the median teeth are longer than those that immediately follow them. In this subfamily, as in most of the others, a tendency to a burrowing habit and fusiform shape appears. The beginning of this is seen in *Coronella*, and in *Ophibolus*, and it becomes very pronounced in a number of genera which inhabit the warmer parts of North America and the Central American district of the neotropical realm. All the truly burrowing genera of the Colubrinæ are American, and they display affinities to genera in which this habit is less marked. Thus the burrowing *Stylosoma* is related to *Ophibolus* of the spotted type and *Cemophora* to the annulate type of the allied genus *Osceola*. Other fusiform burrowing genera are *Chilomeniscus*, *Geagras*, *Conopsis*, and *Ficimia*.

On the other hand, the passage to arboreal types is easy. In the Oriental region *Dendrophis* is the typical tree snake, and in Africa we

¹ *G. frontalis* Cope, examined.

² Type, *Cyclophis major* Günther; China.

have *Thrasops* and *Philothamnus*. In tropical America *Leptophis* is the arboreal representative. We pass from the ground snakes to the tree snakes by *Herpetodryas* and *Cyclophis* in America.

The following is the geographical distribution of the genera above enumerated:

Australian.	Neotropical.	Nearctic.	Palaearctic.	Paleotropical.	Ethiopian.
Dendrophis.....	Cacocalyx. Herpetodryas Leptophis .. Contia Coluber Spilotes Symphimus. Epiglottophis. Hypsiglena..... Trimetopon. Adelphicus.	Cyclophis..... Contia Coluber Rhinechis Pityophis..... Ocoela. Ophiobolis. Stylosoma. Cemophora. Rhinocilius. Conopsis. Geagras. Chilomeniscus. Ficimia. Salvadora. Phyllorhynchus Hypsiglena.	Coronella. Proterodon. Dinodon. 	Dendrophis. Zaoceys. Gonyosoma... Cyclophis ... Contia Coluber Splotea. Cynophis. Entacanthus . Lytorthynchus	Thrasops. Philothamnus, Bucephalus. Dasypeltis. Lytorthynchus.

LIOPELTIS Cope.

Liopeltis COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 559; Bull. U. S. Nat. Mus., No. 32, 1887, p. 56.

Chlorosoma BAIRD and GIRARD (WAGLER), Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 108; not of Wagler.

Head distinct, scuta normal. Rostral plate not modified; one nasal. Teeth equal. Anal and caudal scuta divided. Scales smooth, unifossate (in *L. vernalis*).

This genus includes colubriform species with a single nasal plate perforated by the nostril, with divided anal plate, and with smooth scales. They are of small and medium size, and are frequently of green color. The headquarters of the genus is in Eastern Asia and India, no species existing in Europe or Africa, and but one in North America. Typical Asiatic species are the *L. tricolor* Schlegel, *L. calamaria* Günther, and *L. major* Günther.

In North America the genus ranges the entire realm excepting the Pacific and Sonoran regions.

But one species is known in our fauna.

Scales in 15 rows; superior labials 7; postoculars 2; temporals 1-2; green above; labials and below, pale yellowish green; rather small *L. vernalis*.

LIOPELTIS VERNALIS DeKay.

Liopeltis vernalis COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 560.

Coluber vernalis DEKAY, manuscript, HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 361; Med. Phys. Res., 1835, p. 124.—STORER, Rept. Mass., 1839, p. 224.—

HOLBROOK, N. Amer. Herpt., III, 1842, p. 79, pl. xvii.—DEKAY, New York Fauna Rept., 1842, p. 49, pl. xi, fig. 22.—THOMPSON, Hist. Vermont, 1842, p. 117.

Chlorosoma vernalis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, 1853, p. 108.

Herpetodryas vernalis HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1856, p. 243.

Cyclophis vernalis GÜNTHER, Cat. Colubr. Snakes Brit. Mus., 1858, p. 119.

Contia vernalis BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 258.

Head proportionally long, ovoidal, slightly swollen on the temporal region. Snout rounded and projecting considerably over the lower jaw. The rostral plate shows but little from above. Outlines of prefrontals rounded, internasals proportionally large, and more than half the size of the prefrontals. Frontal hexagonal, elongated, posteriorly more tapering than anteriorly; sides slightly concave. Parietals large, subangular. Superciliaries quite large, broader posteriorly than anteriorly. Postorbitals two, subquadrangular; lower one resting on the

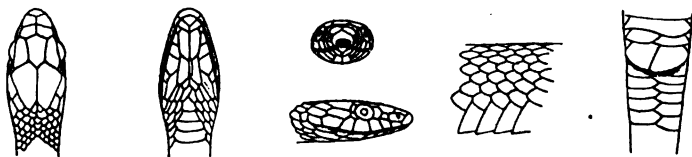


Fig. 169.

LIOPELTIS VERNALIS DEKAY.

= 1.

Eastern Wisconsin.

Cat. No. 1493, U.S.N.M.

commissure of the fourth and fifth upper labials. Anteorbital angular above, rounded below, with anterior margin convex. Loreal angular, longer than high, and proportionally well developed. Nasal elliptically elongated, with nostril in the middle. Three temporal shields, well developed; anterior one elongated, largest. Cleft of mouth curved or undulated. Upper labials seven; fourth largest; fifth and sixth nearly equal to the fourth; third and fourth beneath the eye, forming the inferior part of the orbit. Lower labials eight; fifth largest; the three anterior and three posterior ones quite small. Posterior pair of mental scutellæ longer and slenderer than the anterior pair, extending much beyond the fifth lower labial.

Body elongated, subcylindrical, a little deeper than broad, covered with smooth subhexagonal or subelliptical scales, in fifteen longitudinal rows, the outer row broader than the rest, which diminish toward the middle line of the back. The tail is very much tapering, pointed, and forming about one-third or one-fourth of the total length. Dark green above, lighter on the flanks; yellowish white beneath.

Baird and Girard give the following scale formulæ and measurements, the latter in inches:

	Gastrostegea.	Urostegea.	Length.	Tail.
Westport, New York; female.....	138+1.	79.	18.	5½.
Do.....	137+1.	74.	17.	5.
Do.....	132+1.	94.	17½.	6½.
Lebanon Springs, New York.....			15.	5½.
Do.....			15.	6.
Carlisle, Pennsylvania.....	130+2.	92.	18½.	6½.
Do.....	130+1.		11½.	4.
Racine, Wisconsin.....	128+1.	85.	12½.	4½.
Portland, Maine.....			19½.	5½.
Do.....			18.	5½.
Cambridge, Massachusetts.....	138+1.	79.	18½.	5½.
Do.....			6½.	1½.
?? Mississippi.....	138+1.	69.	20½.	

This species is very constant in the scale formula, preserving fifteen rows in twenty-seven specimens in which I have counted them. The labials are always seven, the only exception being a specimen which had met with an injury on the top of the head (Cat. No. 1495). The fourth labial on the right side and the first and fifth on the left are abnormally divided obliquely. The relation of the loreal to the nasal is changed in four specimens on both sides, and in one, on one side, by the fusion of the two plates. In two specimens there are two preoculars on both sides, and in one on one side only. In another (Cat. No. 434) the oculars are 2-3.

The *Liopeltis vernalis* has a wide range, embracing the entire Eastern, Austroriparian, and Central regions. It is found in the hilly parts of New Mexico, but is rare in Texas. Florida specimens are highly colored. It is in the North that the species especially abound, being much more common in my experience in Massachusetts than in Pennsylvania. Professor Verrill gives it as commonly found at Norway, Maine. It is absolutely harmless.

Liopeltis vernalis DeKay.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1502	1	Carlisle, Pennsylvania.....			Alcoholic type.
1493	2	Eastern Wisconsin.....	— —, 1854	A. C. Barry.....	Alcoholic.
1494	1	do.....		do.....	do.
1484	1	Iowa.....		Odell.....	do.
1485	1	do.....		do.....	do.
8425	1	Abiquin, New Mexico.....	Aug. —, 1874	Dr. O. Loew.....	do.
1474	2	Cambridge, Massachusetts.....			do.
1490	2	Lebanon Spring, New York.....			do.
1501	1	Westport, New York.....			do.
5562	4	Brunswick, Maine.....			do.
5236	1	Neosho Falls, Kansas.....			do.
1490	1	Detroit, Michigan.....			do.
2204	1	Monroe County, Illinois.....			do.
1489	1	Owasso, Texas.....			do.
1495	1	Mississippi.....			do.
2198	1	Lapham, Minnesota.....		R. Kennicott.....	do.
1476	1	Bridger Pass, Wyoming.....		W. S. Wood.....	do.
2199	2	Sand Hill, Nebraska.....			do.

Liopeltis vernalis DeKay—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
434	2	Mexico .....	.....	.....	Alcoholic.
1472	2	Columbus, Ohio .....	.....	.....	do.
9787	1	Webster City, Iowa	— —, 1878	Charles Aldrich	do.
9095	1	Merino Valley, New Mexico.	July —, 1875	Lieut. W. L. Carpenter, U. S. A.	do.
10800	1	Chula, Virginia	— —, 1878	F. H. Cushing	do.
337	1	Fort Kearney, Kansas .....	.....	Dr. Cooper	do.
358	1	do .....	.....	do	do.
10003	1	Florida Keys .....	.....	Wesleyan University, Middletown.	do.
12530	5	Woods Hole, Massachusetts.	.....	.....	do.
11556	2	Georgiana, Florida .....	.....	W. Wittfield	do.
13654	3	Auburn, Maine .....	.....	G. P. Merrill	do.
13679					
13715					
13717					
13718	1	Des Moines, Iowa .....	.....	R. Ellsworth Call	do.
14763					
17420	1	Kenosha, Wisconsin .....	.....	C. W. Richmond	do.
22377	1	Mesilla Valley, New Mexico.	.....	T. D. A. Cockerell	do.
22647	.....	Canada .....	.....	Dr. B. W. Evermann	do.

CYCLOPHIS Günther.

Cyclophis GÜNTHER, Cat. Colubr. Snakes. Brit. Mus., 1858, p. 119.—COPE, Bull.

U. S. Nat. Mus., No. 32, 1887, p. 56.

Ophedrys FITZINGER, Systema Reptilium, 1843, p. 26, *nomen nudum*.—COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 560.

Philophylophis GARMAN, Mem. Mus. Compar. Zool. Cambridge, p. 40.

Head distinct, scuta normal. One nasal plate, one preocular. Teeth equal, smooth. Anal and caudal scuta divided. Scales keeled, bifosate (*C. æstivus*).

This genus, like *Liopeltis*, is found in the temperate and tropical regions of Asia, and in temperate North America only. In the Nearctic realm its range is mainly the Austroriparian region; but it has been taken in the southern part of the Central region, and it ranges also the Carolinian district of the Eastern region. But one species is known in the Western Hemisphere, which is characterized as follows:

Scales in 17 rows; superior labials, 7; temporals, 1-2; tail two and one-half times in total length. Green above; labials and below, light yellow *C. æstivus*

CYCLOPHIS ÆSTIVUS Linnaeus.

Cyclophis æstivus GÜNTHER, Cat. Colubr. Snakes Brit. Mus., 1858, p. 11.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 38.

Coluber æstivus LINNÆUS, Syst. Nat., I, 1766, p. 387.—GMELIN, Syst. Nat., 13th ed., I, Pt. 3, 1788, p. 1114.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827.

Leptophis æstivus BELL, Zool. Journ., II, 1826, p. 329.—HOLBROOK, N. Amer. Herpt., III, 1842, p. 17, pl. III.—BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 106.

Herpetodryas æstivus DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 209.

Ophedrys æstivus FITZINGER, COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 560.

Anguis viridis CATESBY, Nat. Hist. Carolina, II, 1743, p. 57, pl. VII.

Head elongate ovoid. Neck contracted. Frontal plate elongated, subpentagonal, diminishing posteriorly, though not acute. Parietals

elongated, tapering posteriorly, and subtruncated. Prefrontals subrounded; internasals smaller than prefrontals by about one fourth. Rostral rounded, broader than high. Nostril in the middle of the nasal. Loreal subtrapezoidal. Anteorbital angular, much broader above than below. Postorbitals subangular, lower one the smaller. Superciliary well developed, irregularly oblong. A large, narrow first temporal shield, and two large ones following. Upper labials seven; sixth slightly the largest. Lower labials eight; fifth the largest. Posterior mental scutellæ slender and elongated, extending beyond the fifth

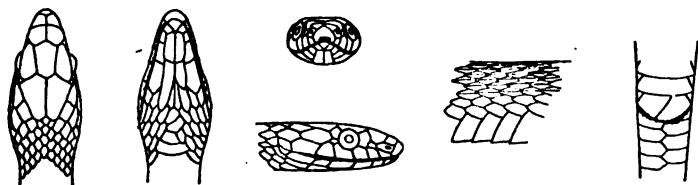


Fig. 170.

CYCLOPHIS ÆSTIVUS LINNÆUS.

=1.

Fort Macon, North Carolina.

Cat. No. 11401, U.S.N.M.

lower labial. Scales subelliptically elongated, strongly carinated except the outer row, which is perfectly smooth, and the second row, which is but slightly carinated. These two external rows are broader than the rest, especially the outermost.

Baird and Girard give the following scutal formulæ and measurements, the latter in inches:

	Gastrosteges.	Urosteges.	Length.	Tail.
Anderson, South Carolina.....	157 + 1.	130.	25½.	9½.
Do.....	154 + 1.	134.	24.	9½.
Kemper County, Mississippi.....	154 + 1.	128.	27½.	10½.
Do.....	154 + 1.	129.	25.	10.
Virginia.....	154 + 1.	126.	33½.	8½.
Anne Arundel County, Maryland.....	155 + 1.	135.	21½.	8½.
Indianola, Texas.....	163 + 1.	111.	29½.	10.
Do.....	156 + 1.	113.	28½.	10½.
Red River, Arkansas.....	163 + 1.	111.	28½.	9½.
New Braunfels, Texas.....	154 + 1.	115.	23½.	8½.

The number of scale rows I found to be constantly seventeen in thirty-two specimens examined, as also the superior labial plates, which are always seven. The loreal plate I found rudimental on one side of one specimen, and once confluent with the nasal on one side only, as is sometimes the case on both sides in *Liopeltis vernalis*. I found two preoculars on one side in two specimens only. In one there are anomalously three on both sides (Cat. No. 1447). In the same specimen there are two loreals, one above the other, on both sides. In three specimens there is but one temporal of the second row on both sides, and in those there is one of the second row on one side only. The length of the

tail varies from two and one-third times to nearly three times in the total length. The twenty-two specimens measured run as follows: Two and one-third times in total length, Cat. No. 9586; two and two-fifths, Cat. Nos. 1447, 12027; two and one-half, Cat. Nos. 1502, 1460, 1433, 1646; two and three-fifths, Cat. Nos. 1439, 9692, 7196; two and two-thirds, Cat. Nos. 7205, 1449, 11401; two and three-fourths, Cat. Nos. 4854, 1446, 11825; two and four-fifths, Cat. No. 1436a; two and five-sixths, Cat. No. 1435; two and five sevenths, Cat. No. 1437; two and six-sevenths, Cat. No. 7197; two and nineteen-twentieths, Cat. No. 1436b.

Baird and Girard have proposed certain individuals as a distinct species under the name of *Leptophis majalis*, on account of the somewhat shorter tail. Individuals from New Mexico have shorter tails than those from the Atlantic region, but the gradation in length is complete. Floridan specimens differ from others in having the keels of the scales stronger and in having the second row strongly keeled like the third, while it is smooth in other specimens; but no other character coincides with this one.

I have described a peculiar habit of this species.¹

Cyclophis æstivus Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1466	1	Kemper County, Mississippi.	.....	.....	Alcoholic.
1467	2	do	.....	.....	do.
1468	1	do	.....	.....	do.
7196	1	Cimarron River, New Mexico.	.....	.....	do.
1439	1	Prince George County, Maryland.	.....	.....	do.
1460	2	Tarboro, North Carolina.	.....	.....	do.
1436	2	Indianola, Texas.	.....	.....	do.
1437	1	Eagle Pass, Texas.	.....	.....	do.
1435	1	New Caswell, Texas.	.....	.....	do.
1433	1	San Antonio, Texas.	.....	.....	do.
2445	1	Matamoras, Texas.	.....	Lieutenant Couch, U.S.A.	do.
1446	1	Indianola, Texas.	.....	.....	do.
1447	2	Gloucester County, Virginia.	.....	.....	do.
2101	1	St. Simons Island, Georgia.	.....	.....	do.
441	1	Savannah, Georgia.	.....	.....	do.
1046	1	Southern Illinois.	.....	.....	do.
1444	1	Pensacola, Florida.	.....	.....	do.
4851	1	New Jersey.	.....	.....	do.
7205	1	Grand Couteau, Louisiana.	.....	.....	do.
1427	1	Fort Smith, Arkansas.	.....	.....	do.
5235	1	Neosho Falls, Kansas.	.....	.....	do.
1450	1	Western Missouri.	.....	.....	do.
1448	1	Anderson, South Carolina.	.....	.....	do.
1449	1	do	.....	.....	do.
7197	1	Fort Bliss, New Mexico.	.....	.....	do.
8795	1	Augusta, Georgia.	.....	William Phillips.	do.
8938	3	Kinston, North Carolina.	.....	H. W. Welscher.	do.
9586	2	Arlington, Florida.	.....	F. C. Goode.	do.
9692	1	do	May —, 1878	G. Brown Goode.	do.
11401	1	Fort Macon, North Carolina.	May —, 1871	Dr. H. C. Yarrow.	do.
12027	1	Mount Carmel, Illinois.	Nov. —, 1881	L. M. Turner.	do.
11412	1	Arlington, Virginia.	Sept. 25, 1881	E. H. Hawley.	do.
11825	1	Old Fort Cobb, New Mexico.	.....	E. Palmer.	do.
13673	5	Georgiana, Florida.	.....	W. Wittfield.	do.
13676					
13677					
13699					
13704					

¹ American Naturalist, VI, p. 309.

Cyclophis astivus Linnaeus—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
13831	1	Olney, Illinois .....	.....	J. and C. H. Walker	Alcohol.
14093	1	Gainesville, Texas .....	.....	G. H. Ragsdale	do.
14148	1	Ripley Landing, West Virginia .....	.....	Herbert B. Croel	do.
15633	1	San Diego, Texas .....	.....	W. Taylor	do.
15648	1	Owago, Kansas .....	.....	Dr. Newton	do.
16800	1	St. Marys, Georgia .....	.....	C. F. Batchelder	do.
17060	3	Cameron County, Texas ..	.....	.....	do.
17061					
17062					
17295	1	Washington, D. C. ....	.....	C. W. Richmond	do.
17172	1	Gainesville, Florida .....	.....	J. H. Bell	do.
17296	1	Washington, D. C. ....	.....	C. W. Richmond	do.
17385	2	Piney Point, Maryland ..	.....	do.	do.
17386					
17533	1	Dunn Loring, Virginia ..	.....	I. D. Piggins	do.
19042	1	Takoma Park, District of Columbia .....	.....	R. W. Shufeldt	do.
17390	.....	Palatka, Florida .....	.....	C. W. Richmond	do.
21568	.....	Queen's Chapel road, District of Columbia .....	.....	Russell J. Thompson ..	do.
22454	.....	Laurel, Maryland .....	.....	Geo. Marshall	do.

ZAMENIS Wagler.

Zamenis WAGLER, part, Syst. Amph., 1830, p. 188.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 683.—GÜNTHER, Cat. Col. Snakes, 1858, p. 101.—JAN, Elenco sist. Ofid., 1863, p. 65.—GÜNTHER, Rept. Brit. Ind., 1864, p. 252.—BOCOURT, Miss. Sci. Mex., Rept., 1888, p. 663.—BOULENGER, Fauna Ind., Rept., 1890, p. 323; Cat. Snakes Brit. Mus., I, 1893, p. 379.

Hæmorrhais BOIE, Isis, von Oken, 1826, p. 982; 1827, p. 538 (*nomen nudum*).—EICHWALD, Faun. Casp.-Cauc., 1841, p. 113.

Tyria FITZINGER, part, N. Class. Rept., 1826, p. 29.

Periops WAGLER, Syst. Amph., 1830, p. 189.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 674.—JAN, Elenco sist. Ofid., 1863, p. 59.

Coluber SCHLEGEL, part, Phys. Serp., II, 1837, p. 125.

Psammophilus SCHLEGEL, part, Phys. Serp., II, 1837, p. 201.

Bascanion BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, 1853, p. 93.—BOCOURT, Miss. Sci. Mex., Rept., 1890, p. 697.—COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 621.

Masticophis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, 1853, p. 98.—JAN, Elenco sist. Ofid., 1863, p. 64.

Coryphodon DUMÉRIL and BIBRON, part, Erp. Gén., VII, 1854, p. 180.—GÜNTHER, Cat. Col. Snakes, 1858, p. 107.—JAN, Elenco sist. Ofid., 1863, p. 63.

Herpetodryas DUMÉRIL and BIBRON, part, Erp. Gén., VII, 1854, p. 203.—GÜNTHER, Cat. Col. Snakes, 1858, p. 113.—JAN, Elenco sist. Ofid., 1863, p. 80.

Leptophis DUMÉRIL and BIBRON, part, Erp. Gén., VII, 1854, p. 528.

Ptyas COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 563.—GÜNTHER, Rept. Brit. Ind., 1864, p. 248.

Platyceps BLYTH, Journ. As. Soc. Bengal, XXIX, 1860, p. 114.

Tyria COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 338.

Megablades GÜNTHER, Ann. Mag. Nat. Hist. (3), XV, 1865, p. 92.

Drymobius BOCOURT, part, Miss. Sci. Mex. Rept., 1890, p. 715.

Boulenger distinguishes two principal divisions of ground Colubridæ as genera under the names *Zamenis* and *Coluber* on dental characters. In the former the maxillary teeth increase in size posteriorly, while in the latter the posterior teeth are not longer, and may be shorter than

the anterior. That this distinction is valid in many instances is well known, but it is admitted by Boulenger that in other instances the transitions are complete. An examination of the penial characters leads me to the opinion that each of these groups is a series of genera rather than a single genus. Thus in the *Zamenis gemonensis*, the type of the genus, we have the normal colubrine structure, from which two divergent lines may be traced. In one of these, represented by the *Z. ventrimaculatus*, the calyces preserve their character, but the few papillæ are ossified as acute spines, the character defining the genus *Acanthocalyx*. In another direction the walls of the calyces are thickened and support several series of papillæ. This is seen in the *Z. ravergerii*. In the next type these numerous papillæ are ossified, giving us the genus *Gonyosoma*. A greater modification is seen in the *Z. florulentus*. Here the thickening of a part of the calyx walls is greatly increased, while other walls, including all of the longitudinal ones, disappear. The result is a mass of papillose pads, a character quite different from anything else in the order and one which defines the genus *Tylanthera*. The explanation of this structure is rendered possible by that of the *Zamenis ravergerii*.

The North American species referred to *Zamenis* by Boulenger have been separated under the name *Bascanium* by Baird and Girard. Most if not all of these species differ from the typical *Zamenis gemonensis* in possessing one or two large hooks at the proximal part of the spinous tract, which remind one of the *Natricinæ*, and which are not found in the typical forms of *Zamenis*. The *Drymobius pulcherrimus* Cope possesses a similar peculiarity, which separates it from the typical species of that genus. It differs from the species of *Bascanium*, however, in having the large spines distad to the spinous tract and not proximad.

The proposition of Boulenger to combine the forms into the genus *Zamenis*, which have been hitherto separated, throws light on the subject, by emphasizing the weakness of the dental characters regarded by Duméril and Bibron as definitive of the genera so included. My discovery of the penial characters, however, shows that this aggregate includes several genera, which may now be satisfactorily defined. Without these Boulenger's *Zamenis* is as difficult to define as a whole as any of the whole groups which he has included in it. How far some of these penial characters are definitive of genera remains in some cases to be ascertained. Thus the disposition of the large spines in the American species is constant in all of them excepting in the *Z. constrictor*, where it is not constant; but I have not yet ascertained how far this inconstancy goes, or whether it precludes the ultimate adoption of the genus *Bascanium* or not. The definition of this group is as follows:

Head distinct; cephalic plates normal. Teeth increasing gradually in size posteriorly, not grooved. Scales smooth, in an odd number of

series, with two apical fossæ. Subcaudal scutellæ in two series; anal plate divided. Two preoculars; loreal present; two nasal plates. Form elongate.

The species of this genus are elongate in form and active in movement, so that the popular names of "whip-snake" and "racer" are appropriate. Although at home on the ground they climb bushes and low trees, rarely ascending to any great height. They are skillful in capturing young birds, as well as small mammals and reptiles. They are distributed over all North America south of the boreal region, and are represented, like most of our other genera of snakes, by a greater multiplicity of forms in the southwestern section of the continent. One species inhabits Mexico exclusively. The species are distinguished as follows:

- I. Scales in seventeen rows; superior labials seven. (Frontal plate nearly as wide as superciliaries posteriorly; muzzle rather produced; colors not in stripes.)
Two labials bounding orbit below; form robust; colors generally uniform, always so on lips and throat.....*Z. constrictor* Linnaeus.
One labial bounding orbit below; form more slender; more or less spotted on the lips and throat.....*Z. mentovarius* Duméril and Bibron.
- II. Superior labials eight; scales in seventeen rows. (Frontal as wide posteriorly as superciliary at same point; loreal longer than deep.)
Rostral plate little prominent; frontal with straight sides not touching prefrontals; loreal subdivided; olive above, yellow below.
Z. stejnegerianus Cope.
Rostral plate prominent; frontal with concave sides in contact with preoculars; loreal entire; light brown above, pale leaden below*Z. conirostris* Cope.
- III. Scales in nineteen rows; superior labials eight. (Frontal plate one-half as wide as superciliary behind; muzzle narrowed, produced.)
Slender; above black; below yellow.....*Z. flagellum piceus* Cope.
- IV. Scales in seventeen rows; superior labials eight. (Frontal plate one-half width of superciliaries posteriorly; form slender.)
Muzzle narrowed, more or less decurved; without or with dark shade or cross-spots anteriorly; young cross-spotted*Z. flagellum* Catesby.
Muzzle narrowed; pale with a lateral brown stripe anteriorly; young striped; no temporal spot.....*Z. semilineatus* Cope.
Muzzle flattened, wider; a yellow stripe on third and fourth rows of scales only; dorsal scales brown; a yellow temporal spot; belly yellow; lateral stripe continuous to origin of tail; throat and upper and lower labials spotted; posterior upper labials less elongate*Z. lateralis* Hallowell.
As *B. laterale*, but lateral stripe broken up on anterior fourth of length, after which a trace only remains; labial plates and throat unspotted; posterior labial plates more elongate*Z. aurigulus* Cope.
- V. Scales in 15 rows; superior labials 8 (form slender; color in stripes).
Muzzle elongate, narrowed; frontal plate more than half as wide as superciliaries posteriorly; two lateral yellow stripes on a dark ventral and dorsal ground; dorsal scales yellow-edged; no temporal spot.
Z. schottii Baird and Girard.
Muzzle elongate, flattened; frontal half as wide as superciliary behind; reddish brown above and below, with two yellow stripes, as in *Z. schottii*, that on the third and fourth rows black-edged and split by a black line; colors above alternately transversely darker and paler.....*Z. ornatus* Baird and Girard.
Muzzle depressed, short; frontal plate half as wide as superciliaries posteriorly; brown above to fourth row of scales; below and sides yellow; later with four or five lines on middle of rows of scales*Z. taeniatus* Hallowell.

Some of the species above admitted are nearly allied, and young specimens are sometimes not readily referred to their proper places. In the first place, although the eyes of young Vertebrata are relatively larger than those of the adult, yet the superciliary plates in this genus encroach more on the frontal in mature than in young specimens, so that in the former the frontal plate is more narrowed posteriorly than in the latter. The color characters of young individuals of *Z. lateralis* and *Z. tæniatus* are sometimes not fully developed, so that their reference is difficult. In all of the species the head plates are pale-bordered in the young, and this character may or may not be continued to maturity in *Z. tæniatus*. *Z. constrictor* and *Z. flagellum* are cross-banded and spotted in youth, but this character disappears except on the anterior dorsal region of the latter species, where it is frequently retained.

The species are distributed as follows:

Eastern region: *Z. constrictor*.

Austroriparian region: *Z. constrictor*; *Z. flagellum*.

Central region: *Z. constrictor*; *Z. tæniatus*.

Pacific region: *Z. constrictor*; *Z. flagellum*; *Z. tæniatus*; *B. lateralis*.

Sonoran region: *Z. flagellum*; *Z. piceus*; *Z. schottii*; *Z. lateralis*; *Z. ornatus*; *Z. tæniatus*.

The number of rows of scales is very constant. Apparent exceptions are referred to under the head of *Z. lateralis*. The number of labial scuta is very constant except in the Californian representatives of *Z. constrictor*. The small inferior preocular plate is very constant in *Bascanium*, its only absence being noticed in a very few specimens of the Californian form of *Z. constrictor*. The temporal scales are always normally 2-2-2, and rarely vary from it.

The anterior and posterior parts of the body are frequently differently colored in this genus. This is especially the case with *Z. flagellum*, *Z. f. semilineatus*, and *Z. ornatus*, where the posterior region is paler than the anterior, and is lacking in the pattern. In *Z. constrictor* the transition from the black to the green variety is first seen in fading out of the black on the tail and posterior part of the body.

As regards the striped forms we have evidence how the young differ from the adult in *Z. semilineatus* and *Z. tæniatus*. In these the tendency to form distinct wider bands is stronger than in the adult, where they are subdivided and more or less obliterated. Thus the young of both these forms resemble more *Z. lateralis* than do the adults. We may then regard *Z. lateralis* as representing a primitive form for this series. The primitive form for *Z. flagellum* and *Z. constrictor* was probably a cross-banded form, but no such species is known. In this respect the last-named species resemble the species of the genus *Drymobius*, where the young are cross banded or spotted. Some spotted *Drymobii* are known where the adults are spotted.

The remains of a *Zamenis* were found by Mr. C. M. Wheatley in the bone cave at Port Kennedy, Pennsylvania, which furnished so many species of extinct Mammalia.

ZAMENIS CONSTRICTOR Linnæus.

Zamenis constrictor BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 387.

Coluber constrictor LINNÆUS, Syst. Nat., I, 1766, p. 385.—GMELIN, Linn. Syst. Nat., 13th ed., I, Pt. 3, 1788, p. 1109.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 348.—SCHLEGEL, Ess. Phys. Serp., 1837, p. 133, pl. v, figs. 3, 4.—STORER, Report Rept. Mass., 1839, p. 225.—HOLBROOK, N. Amer. Herp., III, 1842, p. 55, pl. xiv.—THOMPSON, Hist. Vermont, 1842, p. 117.—DEKAY, New York Fauna Rept., 1842, p. 35, pl. x, fig. 20.—GARMAN, Memoirs Mus. Comp. Zool. Cambridge, p. 41, pl. iv, fig. 3.

Hierophis constrictor BONAPARTE, Fauna Italica, L, 1841 (*nomen nudum*).

Coryphodon constrictor DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 183.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 108.

Coluber flaviventris SAY, in Long's Exped. Rocky Mts., II, 1823, p. 185.

Bascanium constrictor BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 93.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 40; Proc. U. S. Nat. Mus., 1893, p. 623.

Bascanium flaviventris BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 96.

Coryphodon flaviventris HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1856, p. 241.

Bascanium fremontii BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 95.

Bascanium foxii BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, 96.

Bascanium retustus BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 97.—GIRARD, U. S. Expl. Ex., 1858, p. 127, pl. viii, figs. 12–19.—COOPER, Pac. R. R. Report, XII, Pt. 2, 1860, p. 301.

Bascanium constrictor retustum COPE, Check-list N. Amer. Batr. Rept., 1875, p. 40.—YARROW, U. S. G. Surv. W. of 100th mer., V, 1875, p. 541.

Frontal diminishing for half its length, lateral borders then parallel. Center of eye over the fourth labial. In the adult, color varying from

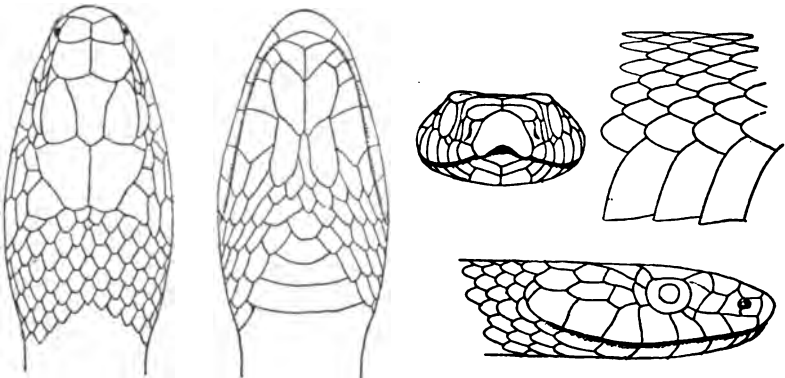


Fig. 171.

ZAMENIS CONSTRICTOR LINNÆUS.

=1.

Tioga County, New York.

Cat. No. 7194, U.S.N.M.

lustrous pitch black to brownish green above, and beneath from greenish black, sometimes tinged with greenish white, to yellow. Chin and

throat white. The young are olive, with rhomboidal dorsal blotches; beneath greenish white.

Frontal plate much longer than broad, pentagonal, anterior margin convex, the lateral strongly concave, the plate rapidly diminishing to half its length, thence the sides nearly parallel, terminated by a rather obtuse angle; a little shorter than the parietals. Superciliaries large, rather broad. Rostral rather broad and high, wedged to a slight extent between the prefrontals. Eye large, its center before the middle of the commissure and over the fourth labial. The lower anteorbital very small, wedged in between the upper anteorbital, the loreal, the third labial, and the eye. Loreal trapezoidal, oblique, moderate. Labials above seven; the first, third, and fifth smaller than the rest, the third and fourth entering into the orbit; the fourth the only one in contact with the lower postorbital; sixth and seventh largest. Lower labials eight, the fifth much the largest. Two rows of temporal scales between the labials and occipitals. Exterior row of dorsal scales very large, diminishing gradually on the back. Scales very thin, the posterior angle moderately truncate, so as to give an elongated hexagonal shape to the exposed portion. Exposed surface of exterior row nearly as high as long.

Color above uniform lustrous pitch black, beneath slate color, sometimes tinged with greenish white. Lower jaw and chin and sometimes edge of the upper labials white. Specimens from the West and Southwest exhibit a more or less bright olive green with the whole under surface greenish white to bright yellow. In one or two specimens there is but one anteorbital.

The young of this species are variegated in color instead of being uniform. The ground color is dark olive, with a succession of darker rhomboidal dorsal blotches from head to tail. These are about nine scales wide, and four or five long, separated by lighter intervals, which, narrow along the back, widen of course rapidly toward the abdomen. The edge of each scale is obsoletely lighter than the center, the dark centers in some scales being of such intensity as to produce the impression of distinct spots, especially on the sides. Along the vertebral region the margins of the blotches are narrowly darker, and those of the intervals lighter than on the sides. Beneath greenish white, each scutella with from two to four dark spots on the edges. Top of head yellowish gray, posterior margins of both pairs of frontals dark chestnut, as are the contiguous edges of the superciliaries and vertical, and posterior edges of the superciliaries and occipitals as well as a small blotch on the outer edge of the superciliaries, and a broad patch in the center of the occipitals running up into the vertical. Sides of head white, especially labials and orbitals; tinged with bluish behind the eyes, and spotted with dark brown.

Specimens over 18 inches lose the blotching, and become more and

more uniform, although to a considerable size showing traces of the spots on the abdominal scutellæ.

Transitions between the Eastern black and the Western green forms of this species are frequently met with in the region connecting the two habitats. Thus in Michigan the species is generally of a bluish green or greenish blue tint above, and is known as the "blue racer." Similar specimens are in the U. S. National Museum from New Orleans. On the yellow-bellied form of the Plains, Say proposed his *Coluber flaviventris*, which was regarded as a distinct species by Hallowell and by Baird and Girard. I, however, do not find it to be more than a geographical color race. The same color characterizes specimens from the Pacific district, which are also inferior in size to Eastern individuals, and frequently have the head a little shorter. In spite of this fact they incline to develop an additional labial plate, the number being occasionally in this region eight on one or both sides. Thus of eleven black Eastern specimens only two have eight superior labials on both sides. Of twenty-two yellow-bellied specimens, three have the labials, seven on one side and eight on the other, and nine have eight on both sides. Of the twelve specimens thus exceptional, seven are from the Pacific region and five from the great basin of Nevada and Utah, of the Central region. This is the *Bascanium vetustum* of Baird and Girard. In the type specimen the sixth upper labial reaches the lower postocular; but this is exceptional and rarely occurs in Californians or other individuals.

A remarkable color variety of this species was described by me under the name of *Bascanium anthicum*. In this form the general color is as in the dark-bluish tinted variety, but numerous scales on all parts of the body are a bright yellow. The yellow scales are rarely regularly arranged, but sometimes show a tendency to a distribution in chevron-shaped crossbands. A specimen of this kind was sent me by my friend Prof. Pendleton King, from near Baton Rouge, Louisiana. The typical specimen, which is in the U. S. National Museum, is of uncertain locality, but was alleged to have been brought from Siam, most probably erroneously.

Another color variety is represented by a single specimen (Cat. No. 10481) from Galveston, Texas. It is of the yellow-bellied type, but the dorsal color is yellowish brown, and small black specks rather sparsely mark the gastrosteges, and from two to four inferior rows of scales throughout the length. The loreal is as high as long.

A black *Zamenis* was described by Baird and Girard as having been brought from California, under the name of *B. fremontii*. The specimen is a typical *Z. constrictor*, and was taken probably in the Eastern region. The *B. foxii* Baird and Girard is the same.

Baird and Girard give the following scutal formulæ and measurements, the latter in inches:

	Gastrosteges.	Urosteges.	Length.	Tail.
Carlisle, Pennsylvania	178+1.	93.	40½.	10½.
Do	189+1.	95.	50.	12½.
Do	184+1.	95.	58.	13.
Do	178+1.	95.	37½.	10 .
Anderson, South Carolina	179+1.		41.	
Do	185+1.	90.	47½.	12½.
Kemper County, Mississippi	175+1.		30.	6½.
Do	181+1.		43½.	11½.
Mississippi	181+1.	110.	33.	10.
Prairie Mer Rouge, Louisiana	183+1.		28½.	
Carlisle, Pennsylvania	183+1.	91.	21.	5½.
Do	186+1.	83.	15½.	3½.
Do	183+1.	91.	21.	5½.
Anne Arundel County, Maryland	184+1.	94.	14½.	3½.
Anderson, South Carolina	180+1.	100.	21½.	5½.
Do	177+1.	93.	21½.	5½.
Charleston, South Carolina	177+1.	105.	21½.	5½.
California	183+1.		55.	12½.
San Diego, California	174+1; 86; 1,080 mm.; 235 mm.			

The length and diameter of the tail vary considerably, some being quite slender and others quite robust. Of the slender-tailed forms, two (Cat. Nos. 8298, 4498) are females. The lengths are as follows: *B. c. constrictor*: three and one-fifth in total length, Cat. No. 8298; three and three-fifths, Cat. No. 4447; three and two-thirds, Cat. No. 11440; three and three-fourths, Cat. Nos. 1764, 4448; four and two-fifths, Cat. Nos. 7194, 1788; four and one-half, Cat. No. 4444; four and three-quarters, Cat. No. 10650. *B. c. flaviventris*: three and two-fifths, Cat. No. 10717; three and two-thirds, Cat. No. 12588; three and four-fifths, Cat. No. 4418; three and six-sevenths, Cat. No. 2132; four, Cat. No. 1741; four and one-tenth, Cat. No. 7812; four and one-third, Cat. No. 7812b; four and two-fifths, Cat. No. 12581.

The *Zamenis constrictor* is the "black snake" of the East and the "blue" and "green racer" of the West. It is everywhere an active, vigorous snake, getting over the ground or through the branches of bushes with great rapidity. It is courageous, and will sometimes attack, moving forward with the head raised from 1 to 2 feet above the ground. It, however, quickly turns about and runs if the enemy preserves a bold front. In confinement it is sometimes quite irascible, showing attack on every movement of its captor. It is, however, easily tamed, and then takes food, being said to be especially fond of milk. Of all our snakes it is the most useful to the farmer, from the great number of moles and mice which it consumes. It is also a robber of birds' nests.

Dr. Henry Brons gives the following account of the courtship of the green racer of the Kansas plains:¹

The manner of union of the sexes at this season is rather instructive. The female among the racers (*Bascanium*) is larger and darker than the males, and not so grace-

¹ American Naturalist, 1882, p. 365.

ful in form or movements. She, at times, seems to toy with the male, indisposed to yield to his importunities, though pressed with ardor. To avoid his snit, at times, she will dart through grass, among stones, or enter a crevice. Should he be able to reach his mate while within a hole, he is not slow in bringing her to the surface, again to be repulsed. Upon an unbroken ground the sexual communion is less prolonged. Here she is unable to free herself from his quick and effectively directed moves. In case she attempts to quit him, a coil is thrown about her body, and his head laid flat upon her neck, and replaced as promptly as dislodged, evidently in the endeavor to propitiate her.

The constricting power of the black snake is not sufficient to cause inconvenience to a man, but might seriously oppress a child. The pressure exercised by a strong individual wound round the arm is sufficient to compress and close the superficial veins, and cause the muscles to ache, but it is easy to unwind the snake with the free hand and arm. The black snake is harmless, and its bite, which it rarely inflicts, only amounts to a serious scratch.

Zamenis constrictor Linnaeus.

BLACK FORM.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4444	1	Grosse Island, Michigan	.....	Rev. C. Fox	Alcoholic.
4449	1	Tyree Springs, Tennessee	.....	Prof. R. Owen	do.
1758	1	Fort Smith, Arkansas	.....	.....	do.
4443	1	St. Simons Island, Georgia	.....	J. P. Postell	do.
4448	1	Salem, North Carolina	.....	J. T. Linebach	do.
4423	1	Charleston, South Carolina	.....	Dr. S. B. Barker	do.
2396	2	Salt Creek, Ohio	.....	.....	do.
4800	1	New Orleans, Louisiana	.....	.....	do.
4438	1	Mississippi	.....	R. Kennicott	do.
4413	1	Western Missouri	.....	Dr. P. R. Hoy	do.
7194	1	Tioga County, New York	.....	.....	do.
1764	1	Brazos River, Texas	.....	.....	do.
4817	1	Palatka, Florida	.....	T. Glover	do.
9695	1	Arlington, Florida	.....	G. B. Goode	do.
8298	1	Fort Wayne, Indiana	.....	Dr. B. J. D. Irwin, U. S. A.	do.
11440	1	Gainesville, Florida	.....	Jas. Bell	do.
9082	1	Statesville, North Carolina	.....	A. S. Barringer	do.
10053	1	Washington, District of Columbia	.....	H. Horan	do.
1788	1	.....	.....	Gen. J. C. Frémont	Alcoholic. (Type of <i>B. fremonti</i> .)
12764	1	Punta Rosa, Florida	.....	C. W. Ward	Alcoholic.
17841	1	Key West, Florida	.....	U. S. Fish Commission	.....
16378	1	Dismal Swamp, Virginia	.....	Dr. D. S. Jordan	.....
14015	1	Wheatland, Indiana	.....	R. Ridgway	Alcoholic.
14137	1	Alabama	.....	T. S. Doran	do.
14439	1	Wytheville, Virginia	.....	Col. M. McDonald	do.
10830	1	Brookland, District of Columbia	.....	W. B. Barrows	do.
17963	1	Irvington, Indiana	.....	O. P. Hay	do.

INTERMEDIATE COLOR.

4436	1	Prairie Mer Rouge, Louisiana.	.....	Jas. Fairie	Alcoholic.
7199	1	Liberty County, Georgia	.....	Dr. Jos. Jones	do.
1749	1	Quasqueton, Iowa	.....	Dr. E. C. Bidwell	do.
10650	1	Wheatland, Indiana	.....	Robt. Ridgway	do.
4416	1	Delaware County, Ohio	.....	E. F. Odell	do.
4447	1	Mississippi	.....	Col. B. L. C. Wallis	do.
4418-9	2	Puget Sound, Washington.	.....	U. S. Exploring Expedition.	Alcoholic. (Type of <i>B. vetustum</i> .)

Zamenis constrictor Linnaeus—Continued.

INTERMEDIATE COLOR—Continued.

Catalogue No.	Number of specimens.	Locality	When collected.	From whom received.	Nature of specimen.
16712	1	New Orleans, Louisiana	.....	G. Kohn	.....
18373		do	.....	Dr. R. W. Shufeldt	.....
16830		Brookland, District of Columbia.	.....	W. B. Barrows	.....
16833-4		Laurel, Maryland	.....	Frederick C. Test	.....
17298-9		Washington, District of Columbia.	.....	C. W. Richmond	.....
17555		Dunn Loring, Virginia	.....	J. D. Figgins	.....
17685		Tampa, Florida	.....	C. T. Simpson	.....
17956				O. P. Hay	.....
17963		Irvington, Indiana	.....	do	.....
19089-40		Takoma Park, District of Columbia.	.....	Dr. R. W. Shufeldt	.....
19815		Rapid Creek, Rapid City, South Dakota.	.....	U. S. Fish Commission	.....
19857		North America	.....	W. Hallett Phillips	.....
19971		Rappahannock County, Virginia.	.....	Albert E. McConnell	.....
22335		Kissimee River, Osceola County, Florida.	.....	Wm. Palmer	.....
22366		Orange Hammock, De Soto County, Florida.	.....	do	.....
22369		do	.....	do	.....
22698		Fort Bassenger, De Soto County, Florida.	.....	E. Ridgway	.....

GREEN AND YELLOW FORM.

2182	1	Fort Tejon, California	.....	Lieut. R. S. Williamson, U. S. A.	Alcoholic.
1765	1	Pitt River Valley, California.	.....	do	do.
1751	1	Presidio, California	.....	Lieut. W. P. Trowbridge, U. S. A.	do.
1741	1	San Francisco, California.	.....	R. D. Cutts	do.
1768	1	Matamoras, Mexico	.....	Lieutenant Couch, U. S. A.	do.
1783	1	Salt Lake Valley, Utah	.....	J. S. Bowman	do.
1760	1	Fort Steilacoom, Washington.	.....	do	do.
458	1	Vermont	.....	do	do.
9522	1	Honey Lake, California	July —, 1877	H. W. Henshaw	do.
10717	1	Ogden, Utah	.....	Davis	do.
5226	1	Fort Steilacoom, Washington.	.....	do	do.
10719	1	Ogden, Utah	— —, 1878	Davis	do.
9126	1	Above Powder River	Aug. —, 1873	Prof. J. A. Allen	do.
8431	1	Pueblo, Colorado	July 14, 1874	C. E. Aiken	do.
2130	1	Ruterville, Texas	.....	Col. J. D. Graham, U. S. A.	do.
2181	1	do	.....	do	do.
7195	3	Fort Kearney, Nebraska	.....	do	do.
1748	1	Near Bridgers Pass, Wyoming.	.....	do	do.
1753	1	Red Fork Pass, Wyoming.	— —, 1856	W. S. Wood	do.
1744	1	Platte River, Nebraska	.....	do	Alcoholic, and eggs.
1743	1	do	.....	Lieut. Bryan	Alcoholic.
1760	1	Long Lake, Nebraska	.....	do	do.
2111	1	North Fork Arkansas River.	.....	do	do.
4412	2	Calcasieu Pass, Louisiana.	.....	do	do.
4415	1	do	.....	do	do.
8982	2	Kernville, California	.....	E. Samuels	do.
10717	1	Ogden, Utah	— —, 1878	Davis	do.
10719	1	do	— —, 1878	do	do.
2132	1	Fort Tejon, California	.....	do	do.
4454	1	Puget Sound	.....	U. S. Expl. Exped	do.
10809	1	South Oregon	.....	H. W. Henshaw	do.
10908	1	do	.....	do	do.
12583	1	Walla Walla, Washington	.....	Capt. C. Bendire	do.
11782	1	Fresno, California	.....	G. Eisen	do.
12577	1	do	.....	do	do.
12581	1	John Day River, Oregon	.....	Capt. C. Bendire	do.
12588	1	Oregon	.....	do	do.
1771	1	Rocky Mountains	.....	Dr. G. Suckley	do.
10481	1	Galveston, Texas	.....	Ens. M. L. Wood	do.
11727	1	Camp 12, Nevada	.....	R. Ridgway	do.
10799	1	Kuwapin Valley, Oregon	.....	G. M. Wheeler	do.

Zamenis constrictor Linnaeus—Continued.

GREEN AND YELLOW FORM—Continued.

Catalogue No.	Number of specimen.	Locality.	When collected.	From whom received.	Nature of specimen.
13797	1	Baird, Shasta County, California.	.....	C. H. Townsend	Alcoholic.
13002	1	New Orleans, Louisiana ..	.....	R. W. Shufeldt	do.
10429	1	Stockton, California.....	.....	L. Belding	do.
13764	1	Fort Klamath, Oregon.....	.....	Capt. Bendire	do.
14533	6	Fort Custer, Montana .....	.....	.....do.....	do.
16354	1	San Diego, California.....	.....	C. R. Orcutt	do.
14765	.....	Raccoon River, Des Moines, Iowa.....	.....	E. Ellsworth Call	do.
16664	.....	Denver, Colorado .....	.....	H. G. Smith, jr	do.

YOUNG SPECIMENS.

1757	2	Klamath Lake, Oregon ..	.....	Exploring Expedition ..	Alcoholic.
1785	2	do.....	.....	.....do.....	do.
2176	1	do.....	.....	.....do.....	do.
4736	1	Micanopy, Florida .....	.....	Dr. J. H. Bean	do.
5549	1	Pensacola, Florida.....	.....	Dr. W. A. Hammond, U. S. A.	do.
1775	1	The Dalles, Oregon .....	.....	Governor Stevens	do.
445	1	Grosse Ile, Michigan .....	.....	Rev. C. Fox.....	(Type of <i>B. forst.</i>)
10718	1	Ogden, Utah.....	.....	.....Davis.....	Alcoholic.
10085	1	Hughes, Ohio.....	.....	R. T. Shepherd	do.
5354	8	Kansas .....	.....	Dr. F. V. Hayden	do.
2030	1	Fort Conrad, New Mexico ..	.....	Lieut. R. S. Williamson, U. S. A.	do.
2003	1	Pole Creek Pass, Wyoming.	.....	W. S. Wood.....	do.
8433	1	Tierra Amarilla, New Mexico.	.....	Prof. E. D. Cope	do.
1784	1	Salt Lake Valley .....	.....	J. S. Bowman.....	do.

ZAMENIS STEJNEGERIANUS Cope.

Zamenis stejnegerianus COPE, American Naturalist, XXIX, 1895, p. 678.

In the present species the profile is gently convex, and the rostral plate is slightly prominent. The frontal plate has straight lateral borders, and its anterior angles are well removed from the preocular plates. The loreal is twice as long as deep, and its superior posterior corner is cut off as a separate plate on both sides, and on one a third loreal is cut off below. The eight superior labials are regular and apparently normal. The parietals are truncate posteriorly, and are bounded by three temporals and two small scales externally. Temporals, 2-2-2. Postgenaeals shorter than pregenaeals. Gastrosteges, 166; anal, 1-1; urosteges, 102.

Measurements.—Length, 782 mm.; of tail, 229 mm.

Cat. No. 17065; rows of scales, 17; upper labials, 8; gastrosteges, 165; urosteges, 101.

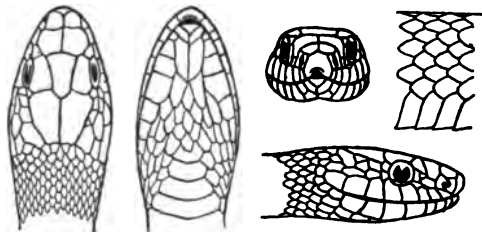


Fig. 172.

ZAMENIS STEJNEGERIANUS COPE.

= 1

Cat. No. 14065, U.S.N.M.

Above and ends of gastrosteges, light brownish-olive; top of head, lips, and inferior surfaces, yellow. Skin between scales, black. Dedicated to my friend Dr. L. Stejneger, of the U. S. National Museum.

Zamenis stejnegerianus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
17065	1	Cameron County, Texas	Purchased	Alcoholic.

ZAMENIS CONIROSTRIS Cope.

Zamenis conirostris COPE, American Naturalist, XXIX, 1895, p. 679.

Profile of muzzle much decurved; rostral plate prominent and sub-conic. Frontal plate with concave lateral borders, and expanded front, in contact with preoculars.

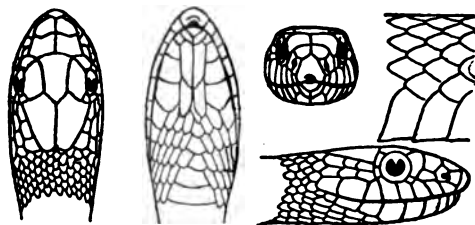


Fig. 173.

ZAMENIS CONIROSTRIS COPE.
= 1.

Matamoras, Mexico.

Cat. No. 1768, U.S.N.M.

A single loreal, which is nearly twice as long as deep, and is deeper posteriorly than anteriorly. Parietal plates rounded posteriorly, bordered by three temporals and two or three scales. Temporals, 2-2-2. Superior labials normal, regular. Postgenaeals equal in length to pregenaeals.

ials. Gastrosteges, 162; anal, 1-1; urosteges, 85.

Measurements.—Length, 758 mm.; length of tail, 200 mm.

Cat. No. 1768; rows of scales, 17; upper labials, 8; gastrosteges, 162; urosteges, 86; total length, 730 mm.; tail, 185 mm.

The specimen may have been taken near the period of moult, so that the color is somewhat uncertain. It is now light brown above and light plumbeous below; the top of the head not lighter than the other superior surfaces. The muzzle is darker in color than the lips and throat. Skin between scales black.

Zamenis conirostris Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1768	1	Matamoras, Mexico .....	.....	

This species and the last one are founded on a single specimen each, which were obtained in nearly the same region of country. They resemble each other considerably in proportions, size, and coloration. The differences are, however, so numerous and important that it is impossible to regard them as belonging to the same species. They

differ equally from all others, the nearest approach to the *Z. stejnegeri-anus* being made by abnormal individuals of the *flaviventris* form of *Z. constrictor*, which have eight superior labial shields. The very different form of the loreal plate, and its subdivision, in the latter, together with the contrast between the color of the head and the dorsum, will distinguish it.

ZAMENIS FLAGELLUM Shaw.

Zamenis flagelliformis BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 389.

Eight superior labials; scales in seventeen rows. Frontal plate narrowed posteriorly, only half as wide as the supraoculars at the same point. Muzzle projecting slightly conic, profile decurved; form slender. The young with transverse spots, more numerous than in *Z. constrictor*.

This widely distributed species is represented by several color forms. These may be aggregated into two types or subspecies, which differ as follows:

Colors pale, except in some regions, the head and adjacent parts dark colored.

Z. flagellum flagellum Shaw.

Black, except the belly, which is pink or yellowish. *Z. flagellum piceum* Cope.

The typical form occupies the Austroriparian and Sonoran districts, while the *Z. f. piceum* is an inhabitant of the Sonoran only.

ZAMENIS FLAGELLUM FLAGELLUM Shaw.

Bascanium flagelliforme flagelliforme COPE, Check-list N. Amer. Batr. Rept., 1875, p. 40.

Anguis flagelliformis CATESBY, Nat. Hist. Carolina, II, 1743, p. 54, pl. IV.

Coluber flagellum SHAW, Gen. Zool., III, 1802, p. 475.

Coluber flagelliformis HOLBROOK, N. Amer. Herpt., I, 1836, p. 107, pl. XIX.

Bascanium flagelliforme bicornutum YARROW, Proc. U. S. Nat. Mus., VI, 1883, p. 153.

Herpetodryas psammophis SCHLEGEL, Ess. Physion. Serpens, II, 1837, p.

Psammophis flagelliformis HOLBROOK, N. Amer. Herpt., 2d ed., III, 1842, p. 11, pl. 2.

Masticophis flagelliformis BAIRD and GIRARD, Cat. N. Amer. Rept. Serp., 1853, p. 98.

Herpetodryas flagelliformis DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 210.—

GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 118.

Coluber testaceus SAY, Long's Exped. Rocky Mountains, 1823, p. 48.—HOLBROOK, N. Amer. Herpt., III, 1842, p. 63.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 348.

Masticophis testaceus BAIRD, U. S. Mexican Bound. Surv., II, Pt. 2, Reptiles, p. 20, pl. XVI.

Bascanium flagelliforme testaceum COPE, Check-list N. Amer. Batr. Rept., 1875, p. 40.

Psammophis flavigularis HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1852, p. 178.

Masticophis flavigularis BAIRD and GIRARD, Cat. N. Amer. Rept. Serp., 1853, p. 99.

Herpetodryas flavigularis GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 118.—

HALLOWELL, Rept. U. S. Pac. R. R. Surv., X, 1859, Williamson's Rept., p. 12.

Frontal plate wide in front, rapidly tapering, until at the anterior third it is less than half as wide as in front, thence the sides are parallel, acutely pointed behind. Superciliaries very broad, projecting. Parietals as long as the vertical. Prefrontals large, anterior smaller. Eye large, its center considerably in advance of the middle of the commissure, and over the junction of the fourth and fifth labials. Upper

orbital very large, extending far forward above, its upper angle reaching the angle of the vertical. Loreal rather large, higher than long. Nasals moderate. Upper labials, eight; the sixth subtriangular and smaller; the seventh and eighth largest of all, elongated, equal. Lower labials, nine, the fifth largest.

Body very slender and attenuated. Dorsal rows of scales seventeen, all smooth, elongated, even the exterior row longer than broad.

Color anteriorly, above and on the sides black to light yellowish-brown, this distinct for one-fourth of the length, fading gradually and becoming lighter to nearly white toward the tail. Behind the darker portion the scales above are brownish-yellow at their basal margin, the

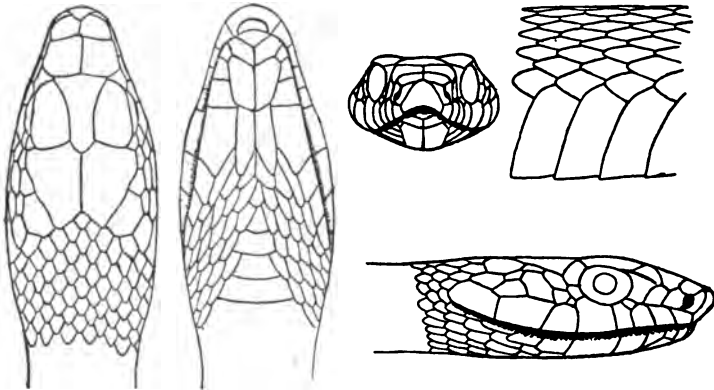


Fig. 174.

ZAMENIS FLAGELLUM FLAGELLUM SHAW.

= 1.

Georgetown, South Carolina.

Cat. No. 4461, U.S.N.M.

rest of the scale more or less mottled with the different shades of brown. The darkest tint is usually seen near the tip of the scales, this on the tail forming a distinct margin. Beneath, the color is yellowish-white, on the anterior fifth more or less blotched with brown or nearly uniform brown, posterior to which it disappears more or less entirely, being represented only by occasional dashes. The ends of each scutella, however, on their margins exhibit the brownish or yellowish blotches, and are colored much like the sides of the body at that place. Anteorbital mostly yellow; postorbital frequently so.

The tail is about one-fourth the total length, but varies within the following range: Three and two-third times in total, Cat. No. 8175; three and three-fourths times, Cat. No. 1768, and one from Mobile, Alabama, collection of E. D. Cope; three and five-sixths, Cat. Nos. 4388, 22640*b*; three and seven-eighths, Cat. Nos. 8859, 12640*a*, 9250; four, Cat. Nos. 2431, 2008, 2429; four and one-fifteenth, Cat. Nos. 11780, 2001; four and one-sixth, Cat. No. 4408.

The scutal formula and measurements in inches are thus given by Baird and Girard.

	Gastrostegees.	Urostegees.	Length.	Tail.
South Carolina	202 + 1.	96.	44.	10½.
Between San Antonio and El Paso.....	193 + 1.	100.	57½.	17½.
Do.....	196 + 1.	100.	65½.	15½.
New Braunfels, Texas.....	196 + 1.	94.	69½.	15½.
Red River, Arkansas.....	191 + 1.	7.	57½.	7.

The color variations of this species are as follows: In half-grown Eastern specimens the head is light brown, with darker cross shades on the head and nape. In adult Eastern specimens the head and from one-fourth to two-thirds the length of the body are deep brown. In Texan adult specimens the anterior regions are sometimes of a strong brown color, but generally they are pale, the top of the head only being of a light brown. In adults from the Sonoran and Pacific regions the posterior part of the head and several wide cross-bands on the nape are of a dark brown or even of a blackish color. In specimens from Arizona these are followed by pink cross-bands, which appear only on the anterior fourth or fifth of the length of the body. In Californian specimens in the National Museum these pink cross-bands appear indistinctly. In specimens from La Paz, at the southern extremity of Lower California, the entire body is a citron yellow, with some black appearing between the scales when the skin is stretched. The head and nape are spotted as in the Californian individuals. In young specimens from Georgia and Florida, as well as from the West, the chin throat and anterior part of the belly for a short distance are spotted by ill-defined spots of light brown. These are represented by cloudy shades, or are entirely lost in the prevailing brown color in Eastern adult specimens. In Texan specimens they disappear entirely in some large adults. In Sonoran and Californian specimens they continue permanently, the spots forming a row on each side of the anterior part of the belly, and blotching the inferior and superior labials. The speckled brown of the temporal region is divided by a pale line extending from the eye posteriorly.

In younger specimens the blotching beneath is more decided. In addition to the colors described, the back is crossed by indistinct bars of darker, eight or nine scales wide and half a scale long. This color is also seen on the skin between the scales under the dark bars, where the bases of the scales themselves are darker instead of light. There is a tendency toward stripes on the side: First, one of light brown on the outer edge of the abdomen; then an interrupted yellow one at the junction of the abdominal scutellæ and outer scales; then brown again through the centers of the rows. This, however, is not very conspicuous. Sometimes the dark shades on the sides are tinged with reddish. The obsolete transverse bars are seen at intervals of one or two scales.

	Gastrostegees.	Urostegees.	Scales.	Length.	Tail.
Between Indianola and San Antonio.					
(Col. J. D. Graham)	197+2.	96.	17.	41½.	10.
Indianola. (Col. J. D. Graham).....	194+2.	110.	17.	40.	10½.
Do.....	197+2.	110.	17.	34½.	9.

A specimen from Fort Webster or Copper Mines shows the stripes on the sides much more distinctly, running through all the dorsal rows anteriorly, and crossed by the indistinct bars already referred to. The contrast between the dark chestnut-brown spots on each side and its deeper center, with the clear yellow of the edges, is very distinct. Beneath yellow, with the blotches reduced to mere dull spots.

Santa Rita del Cobre. (Col. J. D. Graham); gastrosteges, 211+2; urosteges, 101; scales, 17; total length, 39½ inches; tail, 10½ inches.

Specimens in which the dark cross bands behind the head are very pronounced have been referred by Dr. Stejneger to a distinct subspecies under the name of *Z. f. frenatus*. It is true that all specimens from west of the Rio Grande exhibit this character, but in Cat. No. 15970 from Yuma, Arizona, and Cat. No. 4388 from Lajoya, New Mexico, the spots are absent, save a few traces only. They are, in fact, a persistence of the immature coloration, as is especially conspicuous in the type of *Z. f. frenatus*, where the cross bands are present on the greater part of the length. The character is, to my mind, too variable to offer a definition.

I have met with this species in Texas, where it is abundant. I obtained specimens from near Dallas, Houston, Brenham, Helotes, and the upper waters of the Guadalupe and the Llano rivers. Those from Dallas, Brenham, and Houston, which are in the rainy region of Texas, have the greater part of the length a blackish-brown. Those from Helotes, the Guadalupe, and the Llano are entirely pale clay-color. This relation of color to moisture is similar to that observed by Dr. J. A. Allen to prevail among the rodent Mammalia. This is a swift species, and is generally known everywhere as the "whip snake."

This species ranges south into Mexico on the plateau, and southward on the western slope. Thus I have recorded it from Chihuahua, Guajalato, and Guadalajara:

Zamenis flagellum Shaw.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4408	1	Pensacola, Florida		Dr. R. W. Jeffrey	Alcoholic.
2431	1	Columbus, Georgia		D. Gressner	do.
4407	2	Liberty County, Georgia	— —, 1856	Dr. W. L. Jones	do.
4461	1	Georgetown, South Carolina.		Weston	
2429	1	Florida			do.
10682	1	Clearwater, Florida	Oct. —, 1879	S. T. Walker	do.
10685	2	Gainesville, Florida		James Bell	Eggs, dry.
9691	1	Arlington, Florida	May —, 1878	G. Brown Goode	Cast.
9760	1	do	June —, 1878	do	do.
1985	1	New Braunfels, Texas		Dr. F. Lindheimer	Alc. type.
1986	1	Red River, Ark.		Capt. R. B. Marcy, U. S. A.	do.
1996	1	Between Indianola and San Antonio, Texas		Major W. H. Emory, U. S. A.	do.
2001	1	Indianola, Texas			do.
5076	1	Wheelock, Texas			do.
2008	2	Gila and Colorado		Col. J. D. Graham, U. S. A.	do.
1988	1	Alamos de Parros		Lieutenant Couch, U. S. A.	do.
8429	1	New Mexico	— —, 1874	Dr. O. Loew	do.
4139	1	do			do.
1981	1	Copper Mines, New Mexico.		Maj. W. H. Emory, U. S. A.	do.

Zamenis flagellum Shaw—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1995	1	Pesqueria, Grande, N. Leon.	—, 1853	Lieutenant Couch, U.S.A.	Head, alcoholic.
977	1	Pueblo, Colorado.			do.
7203	1	Platte River, Missouri.	Sept. 12, 1856	Lieut. F. T. Bryan, U.S.A.	do.
8428	1	Apache, Arizona.	Aug. —, 1873	H. W. Henshaw.	do.
8116	1	Middle Utah.	—, 1872	Dr. H. C. Yarrow.	do.
2004	1	Fort Yuma, California.	—, 1865	Maj. G. H. Thomas, U.S.A.	do.
1991	2	Canadian River.		Lieut. A. W. Whipple, U.S.A.	do.
2012	1	Salt Lake, Utah.			do.
8175	2	Arizona.	Oct. —, 1871	F. Bischoff.	do.
8859	1	San Francisco, California.	Nov. —, 1875	A. W. Chase.	do.
2011	1	Petaluma County, California.		E. Samuels.	do.
9250	1	Pueblo, Colorado.	—, 1874	Dr. H. C. Yarrow.	do.
11780	2	Fresno, California.	—, 1879	Gustav Eisen.	do.
11750	3	do.	—, 1879	do.	do.
11425	1	Fort Whipple, Arizona.	—, 1865	Dr. E. Cones, U.S.A.	do.
1992	1	Santa Caterina, N. Leon.	—, 1853	Lieutenant Couch, U.S.A.	do.
1989	1	Copper Mines, Coliva Numa.		Lieut. E. S. Beckwith, U.S.A.	do.
4398	1	Lajura, New Mexico.		H. B. Mollhausen.	do.
12640	2	La Pas, L. California.	Feb. —, 1882	L. Belding.	do.
12641	1	do.	Feb. —, 1882		do.
8252	1	Fort Jesso, Louisiana.			do.
8595	1	Mohave Desert, Arizona.		Dr. O. Loew.	do.
6035	1	Arizona.		Dr. Irwin.	do.
11822	1	Guanajuato, Mexico.		Dr. A. Dugès.	do.
15970	1	Yuma, Arizona.		U. S. Fish Commission.	do.
13648	1	Georgiana, Florida.		W. Wittfield.	do.
14085	2	Cook County, Texas.		G. H. Ragsdale.	do.
14098	1	Lower California.		C. R. Orcutt.	do.
14124	1	Fort Huachuca, Arizona.		Lieut. H. C. Benson.	do.
14747	1	Mountain Spring, Colorado Desert, California.		C. R. Orcutt.	do.
16340	1	Georgiana, Florida.		W. Wittfield.	do.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	Date.	From whom received.	Remarks.
			<i>Feet.</i>			
18081		Overton, Muddy Valley, Nevada.		May 6	Merriam.	
18082		Vegas Valley, Nevada.		May 1	do.	
18083	Jun.	Death Valley, Bennett Wells, California.		Jan. 21	Nelson.	
18084		Death Valley, Furnace Creek, California.		June 20	Fisher.	
18085	Jun.	Panamint Valley, California.	4,100	May 15	Nelson.	
18086		Panamint Valley, Hot Springs, California.		Apr. 22	Merriam.	<i>Sitomys</i> in stomach.
18087		Colorado Desert, Palm Springs, California.		Sept. 27	Stephens.	
18088		Keeler, Owens Lake, California.		June 12	Palmer.	Killed in a cellar.
18089		Deep Spring Valley, California.		June 9	Merriam.	Head only.

Catalogue No.	Locality.	From whom received.
16340	Mountain Springs, Colorado Desert, California.	C. R. Orcutt.
22142	Las Cruces, New Mexico, Experiment Station.	T. D. A. Cockerell.
19676	Fort Huachuca, Arizona.	Wilcox.
19677	do.	
22197	do.	Fisher.
22198	do.	Lieut. H. C. Benson.
14747	do.	Dr. E. A. Mearns.
21823	Colorado River bottom, near monument 204, Arizona.	do.
22031	Monument 258, Pacific Ocean.	do.
22032	Mountain Spring, Coast Range, east slope, San Diego County, California.	do.
22033	Jacumba Hot Spring, San Diego County, California.	do.
22576	San Diego County, California.	C. R. Orcutt.
22577	do.	do.
14829	Georgiana, Florida.	Wm. Wittfield.

ZAMENIS FLAGELLUM PICEUS Cope.

Bascanium flagelliforme piceum COPE, Yarrow's Rept. U. S. Geog. and Geol. Surv., W. of 100th mer., V, 1875, p. 617 (name only); Check-list N. Amer. Batr. Rept., 1875, p. 40.

Bascanium piceum COPE, Proc. U. S. Nat. Mus., XVI, 1893, p. 625.

Form elongate, tail three and three-fifth times in the total length. Head elongate, muzzle narrowed forward, moderately protuberant, not flattened, slightly decurved. Rostral plate slightly recurved above; internasals longer than wide. Frontal half as wide as superciliaries behind. Parietals openly truncate, emarginate at posterior margin. Loreal large, longer than high. Temporals 2-2-2. Superior labials eighth, fourth and fifth bounding orbit, sixth subtriangular, seventh and eighth larger and nearly equal, and longer than high. Inferior labials

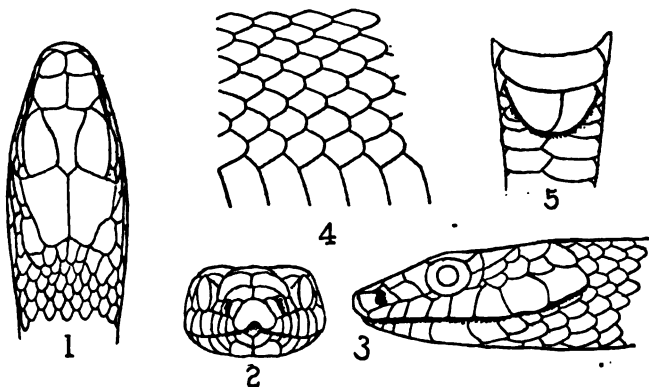


Fig. 175.

ZAMENIS FLAGELLUM PICEUS COPE.

Camp Grant, Arizona.

Cat. No. 7891, U.S.N.M.

ten, fifth largest; postgenaeals not longer than pregenaeals. Scales in 19 longitudinal rows, moderately narrowed in the type, but in other specimens in only seventeen rows. Gastrosteges, 195; anal, 1; urosteges, 108.

Measurements.—Total length, 1,263 mm.; the tail, 355 mm.; end of muzzle to rictus oris, 34 mm.

Color above, to, and including the extremities of the gastrosteges, black. Inferior surfaces light yellow, the anterior fifth of the length with brownish blotches, which are posteriorly few and distant, but become larger and more approximated, until the anterior 30-40 gastrosteges are brown or anteriorly black like the superior surfaces. Labial plates with some pale shades on their middles. Preocular with a light middle, postoculars black. Top of head a little paler than back.

This form might be regarded as a melanistic *Z. flagelliformis* but for the increased number of scale rows, and longer tail. The fact that the

inferior surface does not generally take part in the darkened color indicates a normal color type.

Zamenis flagellum piceus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom derived.	Nature of specimen.
4891	1	Camp Grant, Arizona	E. Palmer	Alcoholic.

ZAMENIS SEMILINEATUS Cope.

Bascanium semilineatum COPE, Proc. U. S. Nat. Mus., XV, 1892, pp. 622-626.

This is a remarkable form, as it occupies a position between several of the species. Thus it has the scale formula and shape of head of *Z. flagellum*, the head coloring of *Z. schottii*, and part of the coloration

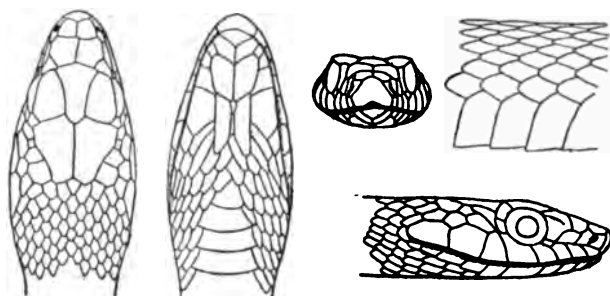


Fig. 176.

ZAMENIS SEMILINEATUS COPE.

= 1.

Colorado River, Arizona.

Cat. No. 1981, U.S.N.M.

between those of *Z. taeniatus* and *Z. lateralis*, and part like that of *Z. flagellum*. Its adult characters ally it most nearly to the last named, but its appearance is quite distinct.

The scales are in seventeen rows, and there are eight superior labials. The posterior part of the frontal is only half as wide as the superciliary plate at the same point. The temporal scales are 2-2-2. The fourth and fifth labials bound the orbit below. The loreal is larger than high. The postgenaeals are a little larger than the pregenaeals. The muzzle is not decurved, and is moderately protuberant, viewed in profile; from above it is elongate wedge-shaped. The tail is long, entering the total length in the specimen before me (Cat. No. 1981) three and one-seventh times.

The general color is a light brownish clay-color (in spirits), the free border of each scale with an elongate whitish spot on each side. The color becomes darker anteriorly so as to be on the anterior fourth of the length, a plumbeous green, with the top of the head light brown.

There are no markings on the superior surface of this region, but the sides are striped, the stripes disappearing on the second fourth of the length of the body. These stripes are bounded by a brown line on the middle of each scale of the second and third rows. Between these the color is like that of the back, while the adjacent halves of the third and fourth rows are light yellow. A fainter brown line runs along the middle of the first row. Belly and throat immaculate light yellow, except a few punctæ along the end of the first dozen gastrosteges. Middles of nasal, loreal, and pre- and postocular plates yellow. Superior labials yellow, with a blackish superior border, extending from the rostral plate back. Temporal region like the top of the head, immaculate. A few black specks on the genæal margins of the inferior labials.

Gastrosteges 201, anal 1; urosteges, 134+. Total length (Cat. No. 1981), 1,185 mm.; of tail (extremity wanting), 375 mm.

A young specimen (Cat. No. 8434) is interesting as showing the distinctness of the color characters as compared with those of corresponding age of the *Z. taniatus* and with the adult *Z. schottii* and *Z. lateralis*. In the first place, the stripes are much more distinct in this specimen than in the adults, as is the case also with the *Z. taniatus*. Moreover, they extend farther along the length of the body, being traceable on the middle third, though they are wanting posterior to it. The stripes are a yellow one on adjacent parts of the third and fourth rows, bounded below by a brown one on the adjacent parts of the second and third rows. A yellow stripe succeeds on the adjacent parts of the first and second rows, while another and paler brown stripe runs on the adjacent parts of the first row and the extremities of the gastrosteges. This pattern, it will be observed, is quite different from that which obtains in any of the other striped species, as the *M. taniatus*, *ornatus*, *schottii*, or *lateralis*. The head is entirely uniform greenish slate color above and on the temples. The superior labials are yellow, the posterior bounded above by a black line from the orbit to the neck. The muzzle of this specimen is broken off.

Zamenis semilineatus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1981	2	Colorado River, Arizona.....	A. Schott.....	Alcoholic.
8259	1	Arizona.....	Lieut. G. M. Wheeler.....	do.
8434	1	Camp Grant, Arizona.....	Rutter.....	do.
14745-6	2	Fort Huachuca, Arizona.....	Lieut. H. C. Benson.....	do.
19678	.....	.....do.....	Wilcox.....	.....
22199-200	.....	Fort Bowie, Arizona.....	Fisher.....	.....
19679	.....	Fort Huachuca, Arizona.....	Dr. T. E. Wilcox.....	.....
21053-4	.....	San Luis Mountains, Mexican boundary line.	Dr. E. A. Mearns.....	.....

ZAMENIS LATERALIS Hallowell.

Bascantium taniatum laterale COPE, Check-list N. Amer. Batr. Rept., 1875, p. 40.

Leptophis lateralis HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1853, p. 237; U. S. Pac. R. R. Report, X, 1859, Williamson's Report, p. 13, pl. iv, fig. 3.

Form slender, head oval, distinct from body, tail a little less than one-third the total length. Scales in seventeen longitudinal rows; superior labials eight, the fourth and fifth bounding the orbit below. Muzzle not elongate nor decurved, but flattened, and its extremity but little prominent. Rostral plate slightly recurved on upper surface of muzzle. Internasals as wide as long. Frontal narrowed behind, half as wide as superciliary in adults. Parietals truncate-marginate posteriorly. Dorsal longer than high. Sixth superior labial truncate above; seventh and eighth longer than high. Nine inferior labials, the fifth largest. Postgenaeals longer than pregenaeals. Temporals 2-2-2.

Color above, including ends of gastrosteges, plumbeous brown; below yellow. A yellow band extends from the neck to varying distances on the adjacent parts of the third and fourth rows of scales. Lateral head

plates from the preoculars forward, with yellow centers. Superior labials with brown splotches above, forming an irregular border, not brown bordered below. A yellow temporal spot.

The posterior labial plates are longer than high, but are not so extended as in the *Z. aurigulus*. The inferior labials anterior to and including the fifth are also less elongate, the fourth being nearly square, while it is parallelogrammic in the *Z. aurigulus*. The muzzle, and hence the loreal plates, are shorter than in that form. The spotting of the inferior surface is confined to the chin, throat, and a dozen or so of gastrosteges. It consists of scattered brown spots which are nearly symmetrical on opposite sides, and which fall into two more or less irregular rows, each a short distance within the extremities of the gastrosteges.

The seventeen rows of scales, together with the coloration, distinguish this form from the *Z. schottii* and the *Z. taniatus*. Young specimens of the latter, however, resemble it closely, since the spaces between the dark lines of the first, second, and third rows are apt to be solidly dark-colored at that age. They may be distinguished, apart from the smaller

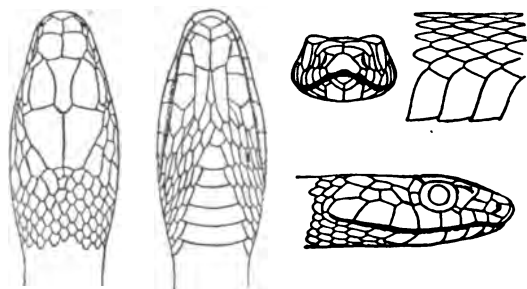


Fig. 177.

ZAMENIS LATERALIS HALLOWELL.

= 1.

Fresno, California.

Cal. No. 11776, U.S.N.M.

number (fifteen) of scale rows, by the different distribution of the lateral stripes. In *Z. l. lateralis* the yellow stripe is confined to the third and fourth rows, and the dark band below it covers the extremities of the gastrosteges. In the *Z. taniatus* the yellow stripe extends to the fifth row of scales, and the inferior band only reaches to the middle of the first row, not attaining the gastrosteges. In *Z. schottii* the superior lateral stripe is as in *Z. l. lateralis*, but the belly is dark and there is a yellow stripe on the adjacent edges of the gastrosteges and first row of scales. The head is unicolor and not spotted, as in the *Z. l. lateralis*. The yellow temporal spot of both forms of the *Z. lateralis* is to be noted as always absent from the allied species. The *Z. semilatus* agrees with the *lateralis* in the possession of seventeen rows of scales, and the young is more fully striped than the adult. It may be distinguished at all ages by the arrangement of the lateral stripes and the uniform coloration of the head. The yellow stripe is, like that of the *Z. lateralis*, on the third and fourth rows only, but the dark band below it only occupies the adjacent parts of the second and third rows, instead of extending to the gastrosteges. There is a yellow band on the adjacent parts of the first and second rows which is absent in the *Z. lateralis*, and there is a dark stripe on the adjacent part of the first row and the gastrosteges, where the inferior yellow stripe is present in the *Z. schottii*. The belly is light, and not dark, as in the last-mentioned species.

Zamenis lateralis lateralis Hallowell.

U.S.N.M. No.	Locality.	Date.	Collector.
18077	Old Fort Tejon, California.....	July 2	Palmer.
19078	Three Rivers, California.....	Sept. 14	Bailey.
18079	Walker Pass, west slope, California.....	July 3, '92	Fisher.
18080	Santa Ysabel, California.....	Oct. 6	Stephens..

Zamenis lateralis lateralis Hallowell.

Catalogue No.	Number of speci- mens.	Locality.	When collected.	From whom received.	Nature of specimen.
4386	1	Fort Tejon, California.....	.....	John Xantus.....	Alcoholic.
4712	1	Fort Buchanan, Arizona.....	.....	Dr. B. J. D. Irwin, U.S.A.	do.
8585	1	Fort Tejon, California.....	Aug. —, 1875	H. W. Henshaw.....	do.
8587	1	Santa Barbara, California.....	Aug. —, 1875	Dr. O. Loew.....	do.
11776	1	Fresno, California.....	— —, 1879	Gustav Eisen.....	do.
12801	1	Baird, Shasta County, California.....	.....	C. H. Townsend.....	do.
13950	1	Howell Mountains, Cali- fornia.....	.....	R. E. C. Stearns.....	do.
14125	1	San Diego, California.....	.....	C. R. Orcutt.....	do.
15135	1	Santa Margarita, Old Lower California.....	.....	U. S. Fish Commission ..	do.
16358	1	San Diego, Island, Cali- fornia.....	.....	C. R. Orcutt.....	do.

Several specimens are in the museum of the Philosophical Academy; and in my own private collection, from Pasadena, California (Dr. H. N. Rust), and San Bernadino, California (J. S. Lippincott). These speci-

mens maintain the characters exactly. Specimens Cat. Nos. 1972, 1974, and 1982, from Texas, Nuevo Leon, and Oregon, enumerated in Yarrow's Check-list under this species, do not belong to it.

ZAMENIS LATERALIS FULIGINOSUS Cope.

Zamenis lateralis fuliginosus COPE, Amer. Naturalist, XXIX, 1895, p. 679.

Bascanium laterale HALLOWELL, COPE, Proc. U. S. Nat. Mus., XII, 1889, p. 147.

Scales in seventeen longitudinal rows; superior labials eight, the fourth and fifth entering the orbit. Muzzle depressed, narrow, and rather prominent. Frontal plate much narrowed posteriorly, its width equal one-half that of a superciliary plate. Seventh and eighth superior labials about equal, of rather wide parallelogrammic form. Temporals, 2-2-2; the last superior large, subquadrate, their posterior borders continuous with that of the parietals. Gastrosteges strongly angulated; tail entering 3.58 times in total length. Scuta, scutellæ, and dimensions:

Cat. No. 15135; gastrosteges, 201; ♀ total length, 815 mm.; tail injured.

Cat. No. 15736; gastrosteges, 205; urosteges, 108; total length, 665 mm.; tail, 253 mm.

Color above blackish brown, anteriorly becoming lighter posteriorly to the end of the tail. The dark color extends on each end of the gastrosteges to the angulation, throughout the length, and in the younger specimen appeared as a row of spots on either side of the middle part of the gastrosteges, fading out beyond the middle of the length. In the larger specimen the dark brown predominates on the inferior surfaces, yielding gradually to the ground color, which predominates on the inferior surface of the tail. Ground color of belly yellow. A yellow spot on the preocular, and in the younger specimen, on the postoculars and labial plates.

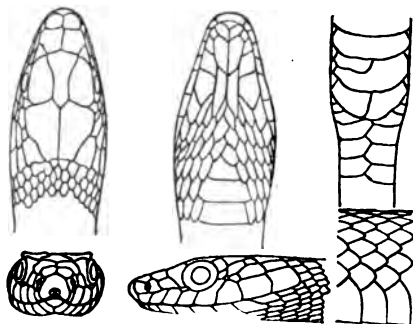


Fig. 178.

ZAMENIS LATERALIS FULIGINOSUS COPE.

= 1.

Santa Margarita Island.

Cat. No. 15135, U.S.N.M.

Gular and genaeal plates yellow-spotted in the younger specimen, nearly uniform dark brown in the older. On the anterior part of the body of the younger specimen the lateral scales to the third and fourth rows have brown shades, with an obscure trace of cross-banding. On the same specimen, near the middle of the body, there are two pale semicross-bands near together. In the same the center of each parietal plate is brown.

This subspecies differs widely from the typical form in color characters.

Zamenis lateralis fuliginosus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.
15135	1	Santa Margarita Island, Lower California	U. S. Fish Commission
15136	1	do	steamer, <i>Albatross</i> . do.

ZAMENIS AURIGULUS Cope.

Bascantium aurigulum COPE, Check-list N. Amer. Batr. Rept. N., 1875, p. 40.

Drymobius aurigulus COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 301.

Scales in seventeen rows, those of the median series very elongate. Crown and muzzle very plane, supercilium and canthus rostralis prominent; eye moderate, muzzle

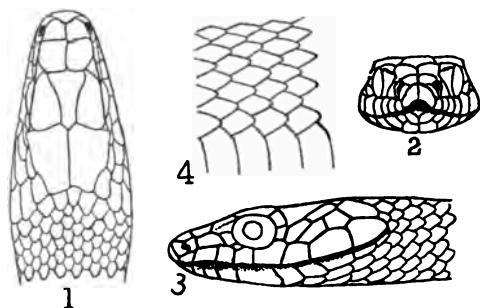


Fig. 179.

ZAMENIS AURIGULUS COPE.

= 1.

Cape St. Lucas.

Cat. No. 8193, U.S.N.M.

more elongate than in any other species of the genus. Rostral plate rounded, slightly prominent, recurved above. Frontal elongate, posteriorly half as wide as each superciliary, not in contact with preocular. Parietals elongate, posteriorly truncate. Nasals and loreals very long, the latter encroaching much on preocular. Three preoculars, two postoculars. Superior labials eight, fourth and fifth entering orbit; the eighth equal in elevation and length to the penultimate; both much longer than high. Inferior labials ten, fifth largest; postgenials longer than pregenials.

Color above brown, becoming nearly black anteriorly. Cephalic plates light brown, shaded with yellow. A narrow yellow band passes round the muzzle from eye to eye. A spot on the temporal region, one on the postoculars; all the labials, the chin, and anterior part of the abdomen bright golden and unspotted, as are also the sides of the neck and anterior fourth of body to the fifth row of scales. On the second and third rows of scales of the latter region is a black band regularly interrupted at intervals of about seven scales, which bounds a yellow lateral stripe above it where present. It finally becomes continuous, and with a band upon the first row almost excludes the yellow ground color upon the posterior and middle parts of the body. Abdomen dirty yellowish, unspotted.

Proportions slender, but the specimen does not include the posterior half of the length. This curiously marked species mostly resembles the *Z. lateralis*. The lateral stripe is confined to the third and fourth rows opposite the lateral black stripe, but at the interruptions extend

to the fifth. The muzzle is more elongate, hence also the nasal and loreal plates and the penultimate and ultimate superior labials are longer. The tendency of the coloration is to produce two series of alternating yellow and black spots along the anterior part of the length. The narrower form of the posterior superior labials distinguishes the type from most individuals of the *Z. lateralis lateralis*, but in a specimen of the latter from Baird, California, these scales approximate nearly the form in the present subspecies.

According to Mr. Van Denburgh this species is quite rare, the explorations of the California Academy of Sciences having brought to light only one other specimen.

Zamenis aurigulus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
5793	1	Cape St. Lucas, Lower California.	John Xantus.....	Alcoholic.

ZAMENIS SCHOTTII Baird and Girard.

Masticophis schottii BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 160.—BAIRD, U. S. Mex. Bound. Surv., II, Reptiles, 1859, p. 20, pl. xviii.

Head elongate, narrow, the muzzle projecting but not decurved. Inferior labials eight; temporals 2-2-2. Frontal narrow posteriorly, but not so much so as in *Z. lateralis*, being about three-fourths the diameter of the superciliaries at the same point. Scales in fifteen rows. Tail long, entering the total length three and a half times.

The general tint above is a dark greenish olive. On each side are two well-defined narrow yellowish-white lines; the first along the junction

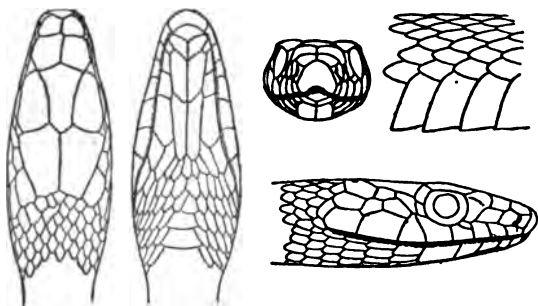


Fig. 180.

ZAMENIS SCHOTTII BAIRD and GIRARD.

= 1.

Eagle Pass, Texas.

Cat. No. 1972, U.S.N.M.

of the outer dorsal row and the abdominal scutellæ, involving only the adjacent angles; the second similarly constituted in relation to the third and fourth rows (not running through the centers of the scales). The portion of the third and fourth rows not involved by the upper white line is black, as is also a narrow margin above the lower white line, of the same diameter with it. The upper angles of the scales in the first row, and the whole of those of the second row, are of a lighter olive than the back. All the scales on the back between the upper

yellow lines of the opposite sides are margined with yellow along their basal edges, only evident on separating the scales. Anteriorly is a short yellow line along the junction of the second and third rows of scales, extending to about the twenty-fifth abdominal scutella.

Color beneath, with the greater part of the scutellæ, closely and minutely blotched with greenish slate. Anteriorly a shade of yellow appears, and near the head the blotching is in two series, as in the rest of the genus. The tail also is nearly unspotted yellowish, except anteriorly. On the external fourth of the abdominal scutellæ the blotching is more confluent, forming a well-defined margin to the lower yellow line. Anteriorly the side of the abdomen is of a dull red. The upper jaw is yellowish white, excepting the lower edges along the first to the sixth labials, which are black. Orbitals, loreal, and nasals with a yellow central spot.

The lateral stripes become obsolete at about three-fifths of the length from the head, so that the body posteriorly is nearly unicolor above. Upper labials yellow, unspotted, but margined below (except the last two) with black, and margined above with greenish slate posterior to the orbit, and brown anterior to it. The nasals, loreal, and preocular have yellow median spot each, but the temporal region and top of head are a uniform greenish slate.

Baird and Girard give the following scutal formula, and measurements in inches:

Eagle Pass, Texas; gastrotages, 201+1; urostages, 138; total length, 54½; tail, 17½.

But two adult specimens referable to this species are known, and they agree in every respect, and differ in coloration and the form of the frontal plate from eight specimens of the *Z. lateralis*, which species they most nearly resemble. The latter all possess also seventeen rows of scales, while the *Z. schottii* possesses fifteen. Some young specimens, however, are in some respects intermediate. So far as regards the form of the frontal plate their characters may be those of immaturity. Thus Cat. No. 11423 has in all respects the coloration of the *Z. lateralis*, but has only fifteen rows of scales. Cat. No. 1982 has a trace of the inferior lateral stripe of the *Z. schottii*, but the space between it and the superior lateral stripe is lined, and the head and labial plates are spotted, both characters of the *Z. taniatus*. Cat. No. 1974 has a trace of the inferior stripe on the middle third of the length, while the superior stripe extends on the anterior two-thirds. The coloration of the head is exactly that of the *Z. schottii*. It may indicate a subspecies of this species.

Zamenis schottii Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1972	2	Eagle Pass, Texas	Arthur Schott.....	Alcoholic.
1974	1	Matamoras, Tamaulipas, Mexico.	Lieutenant Couch	do.

ZAMENIS ORNATUS Baird and Girard.

Masticophis ornatus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, pp. 162, 159.

Bascanium taniatum ornatum BAIRD and GIRARD, COPE, Check-list N. Amer. Batr. Rept., 1875, p. 40.

Excessively elongated. Above very deep maroon, brighter on the sides, beneath mottled; a yellow stripe on each side of the abdomen, and two pairs of short yellow stripes, one behind the other, on the anterior part of the body, and in the fourth dorsal rows. Tail about one-third the total length.

The head is narrow, much elongated, and rather depressed, being considerably less arched than in *Z. flagellum*. The vertical is very much elongated, a little shorter than the occipital. The muzzle is rather broad anteriorly, owing to the greater than usual development

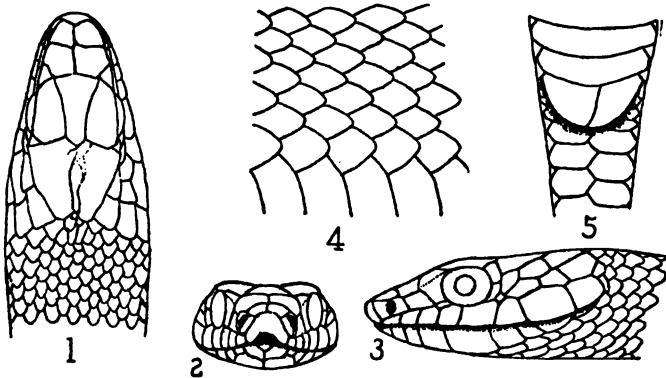


Fig. 181.

ZAMENIS ORNATUS BAIRD AND GIRARD.

= 1.

Howard Springs, Texas.

Cat. No. 1970, U.S.N.M.

of the anterior frontals. The center of the eye is considerably in advance of the commissural line, and behind the junction of the fourth and fifth labial. The upper anteorbital is very large, the lower still smaller than in the other species; in one specimen it is wanting. The sixth labial scarcely touches the postorbital, in one specimen being separated by a small plate. The loreal is elongated, lower than in *Z. flagellum*. Labials, eight above, penultimate largest; nine or ten below, the fifth largest. Rostral broader than high, the reverse being the case in *Z. flagellum*. Dorsal rows of scales, fifteen. The scales are broad, very large, thin, and perfectly smooth. The edges are nearly straight, tip truncated and rounded off. They are decidedly broader than in *Z. flagellum*.

General color above dark purple, becoming almost black toward the back, brighter on the sides; the colors are deeper toward the head;

skin between the scales dark, beneath yellowish, blotched with black; anteriorly the blotches are in the form of two quite contiguous rows of broad, mottled spots, which become broken posteriorly, and overspread the abdomen; anteriorly these are dark brown, posteriorly they are lighter and tinged with red; the tail is immaculate, reddish white. A narrow yellow line along the contiguous edges of the abdomen and outer dorsal rows. The fourth row of scales with the adjacent edges of the third and fifth, are yellowish white, with a well-defined black line through the center of the former. Down the center of all the rows as well as the fourth, is a black line, most intense on the first and third rows. At successive intervals along the back are seen broad, transverse light bands, produced by the obliteration of the black line in the fourth row, and by all the dorsal scales between the light lines being yellowish white, with more or less of purplish black toward the tips. There are about eight of these dorsal marks on the anterior three-fifths of the body, the first being indicated by a light bar on the nape.

The following scutal formula and measurements are given by Baird and Girard, the latter in inches:

	Gastrosteges.	Urosteges.	Total length.	Tail.
Between Indianola and El Paso, Texas	203 + 1.	149.	65½.	22
Do	204 + 1.	152.	65.	22
Howard Springs, Texas	206 + 1.	†	61½.	17½

The above specimens are adult. The relative lengths of the tail in two of them are: Cat. No. 1970, two and twelve-thirteenths in total length; Cat. No. 1971, two and nine-tenths in total length.

They differ in coloration only in the degree of paleness of the longitudinal stripes and cross-shades, the colors being less contrasted in some than in others.

Although this species has the scale formula, and some resemblance in coloration to the *Z. taniatus*, I can not now refer it to that species. The head is elongate, with narrow protuberant muzzle more like the *Z. flagellum* and *Z. piceus* than the *Z. taniatus* and *Z. lateralis*. The *Z. ornatus* displays the unusual peculiarity of a striped species with a tendency to become annulate.

Zamenis ornatus Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1970	1	Howard Springs, Texas.....	Maj. W. H. Emory, U. S. A...	Alcoholic.
1971	2	Western Texas.....	Col. J. D. Graham, U. S. A...	do.

ZAMENIS TÆNIATUS Hallowell.

Zamenis tæniatus BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 390.

Leptophis tæniata HALLOWELL, Proc. Acad. Nat. Sci. Phila., VI, 1852, p. 181.

Masticophis tæniatus BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 103.

Bascanium tæniatum COPE, Check-list N. Amer. Batr. Rept., 1875, p. 40.

Form very slender; head distinct. Muzzle not elongate nor decurved, somewhat flattened; the apex slightly protruding. Eye rather large. Tail a little less than one-third the total length. Rostral plate slightly recurved on the summit of the muzzle. Internasals wider than long. Frontal at the narrowest part equals one-half the width of the superciliary. Parietals openly emarginate, truncate behind. Loreal longer than high; postoculars two; temporals 2-2-2.

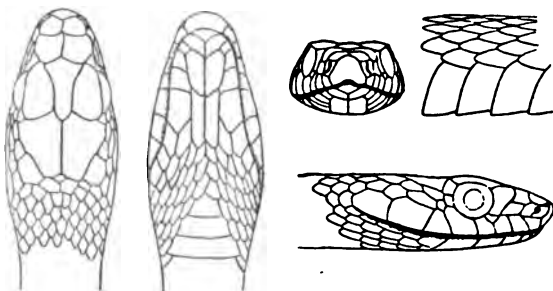


Fig. 182.

ZAMENIS TÆNIATUS HALLOWELL.

= 1.

Little Colorado River, Arizona.

Cat. No. 4384, U.S.N.M.

Superior labials eight, the fourth and fifth bounding the orbit below; the sixth subtriangular, the apex sometimes reaching the inferior preocular; the seventh largest. Inferior labials nine, the fifth the largest. Postgenaeals a little larger than pregenaeals. Scales in fifteen longitudinal rows, those on the anterior two-thirds of the body elongate, those following, wider.

Baird and Girard give the following scutal formulæ and measurements, the latter in inches:

California; gastrosteges, 209 + 1; urosteges, 157; total length, 108; tail, 14.

I add the following, measurements in millimeters:

Provo, Utah; gastrosteges, 207 + 1; urosteges, 138; total length, 1100; tail, 337.

A longitudinal dorsal band, six and two half-scales wide, olive-brown, each scale with a rather deeper spot in the center; the four and a half scales on each side of this band yellow, each row with a narrow brown stripe through its center, fading out in the tail. There are thus five dark stripes on each side, the fifth above margining the dorsal band. Of these stripes, the first and third are narrow, each showing a stripe of yellow of the same size on each side of it; the second and third are closer to each other and broader. Beneath yellowish, with a distinct dark stripe on each side, just within the external row of dorsal scales. The scutellæ otherwise immaculated, except a few scattered dots

toward the head, exhibiting a tendency to arrangement in two rows. Extreme bases of all the scales black.

The above expresses the condition of specimens of medium age. In young examples the head plates have pale margins, and this character sometimes persists in specimens of considerable size. The dark stripes on the extremities of the gastrosteges is absent in half the specimens. The lines on the middles of the dorsal scales are sometimes wanting, so that the back is uniform brown. Sometimes the space between the first and third rows of scales is darker than that between the latter and the middle of the fifth row, thus imitating the *M. laterale*, but with the light stripe thus outlined one row of scales higher up.

The lateral plates from the postoculars forward are yellow with brown borders; the temporals are brown with yellow borders, thus differing from the *M. schottii*, where they are unicolor. The superior labials have their superior and inferior edges brown bordered or rather blotched, except the eighth, which has the lower edge yellow. Inferior labials and genials marked with black specks or blotches.

A young specimen (Cat. No. 3123) has the tendency to a yellow stripe on the third, fourth, and fifth rows of scales above referred to, well marked. The head shields above have narrow pale margins. The frontal plate is not so narrow posteriorly as in the adult from the same and other localities. Still younger individuals (Cat. Nos. 1982, 11423) have the lateral yellow stripe more distinct by the suffusion of the third, second, and half the first rows with brown, thus producing an appearance much like that of the *Z. lateralis*. But only the third and fourth rows have the yellow stripe, and the brown band covers the ends of the gastrosteges of that species. It was this resemblance that induced me to combine the two species, with the remark¹ "the young, of the form *lateralis*, the adult, the *taniatus*."

Measurements.—The measurements of the tail in nine specimens are as follows: Three and one-seventh times in total length, Cat. Nos. 8432 and 4384; three and one-fifth, Cat. Nos. 9520, 8120, and 11422; three and one-fourth, Cat. Nos. 13618 and 1979; three and one-third, Cat. Nos. 8122; three and one-half, Cat. No. 1983.

The distribution of this elegant snake is throughout the Sonoran region north to Salt Lake and western Colorado, and in the Pacific north to Baird, Shasta County. I have met with it in the Rio Grande Valley as far south as Laredo, Texas. I observed a specimen strung through the branches of a screw-bean thicket. It eyed me for a time, perfectly protected by the hard spines of the bushes, which prevented me from seizing it. On being stirred up it moved off rapidly and gracefully through the branches.

¹ Proc. Acad. Nat. Sci. Phila., 1866, p. 305.

Zamenis taniatus Hallowell.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1979	1	California .....	.....	Dr. Wm. Gambel	Alcoholic.
8122	1	Provo, Utah	—, 1874	Dr. H. C. Yarrow	do.
8124	1	do .....	.....	.....	do.
4384	1	Little Colorado .....	.....	H. B. Mollhausen	do.
1983	1	Canon Creek, Colorado .....	.....	Dr. C. G. Newberry	do.
2110	1	West of Rio Grande .....	.....	.....	do.
8432	1	Nutria, New Mexico	July —, 1872	H. W. Henshaw	do.
8120	1	Antelope Springs, Nevada	—, 1872	Dr. H. C. Yarrow	do.
9498	1	Walker Basin, California	Sept. 2, 1875	H. W. Henshaw	do.
9520	1	Carson, Nevada	May —, 1877	do	do.
11422	1	Fort Whipple, Arizona	—, 1865	Dr. E. Coues, U. S. A.	do.
13618	.....	Baird, California .....	.....	C. H. Townsend	do.
1982	1	West of Rocky Mountains, "Oregon" .....	.....	Governor Stephens	do.
11423	1	Fort Whipple, Arizona .....	.....	Dr. E. Coues	do.
15704	1	Prescott, Arizona .....	.....	Capt. W. L. Carpenter	do.
10716	1	Ogden, Utah .....	.....	— Davis	do.

U.S.N.M. No.	Locality.	Altitude.	When collected.	Nature of specimen.
		<i>Fect.</i>		
18072	Argus Range, Maturango Spring, California .....	.....	May 4	Fisher.
18073	Coso Valley, California .....	.....	May 5	do.
18074	Coso Valley, near Maturango Spring, California .....	.....	May 11	Palmer.
18075	Coso Mountains, Coso, California .....	.....	May 18	Fisher.
18076	Panamint Mountains, Willow Creek, California	5,400	May 19	Nelson.

SALVADORA Baird and Girard.

Salvadora BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 104.—

COPE, Bull. U. S. Nat. Mus., No. 32, 1887, pp. 57, 72.

Phimothyr COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 566; Check-list N. Amer.

Batr. Rept., 1875, p. 38.

Form elongate, head distinct from body. Cephalic plates normal, except rostral shield, which is expanded laterally with more or less free margins, and is recurved on the summit of the muzzle. Two nasals. Preocular divided. Scales smooth bifurcate. Anal and subcaudal scutellæ divided. Teeth longer posteriorly. Pupil round.

This genus is more like the *Lytorhynchus* of Peters of Africa and the adjacent parts of Asia, and like it, inhabits, as to its typical form, the *S. grahamiæ*, dry and rocky regions. It has the same peculiarly expanded rostral plate as the genus *Phyllorhynchus* Stejneger, and displays a similar tendency to division of the lateral head shields. Three species of *Salvadora* are known, all of which are found within the political limits of Mexico, and one of them (*S. grahamiæ*) occurs also in the Sonoran region within the United States.

I proposed¹ to change the name of this genus, because it had been previously given by Linnæus to a genus of plants. As it is not now regarded as necessary to maintain uniform difference between plant and animal generic names, I have recurred to the name of Baird and Girard.

¹ Proc. Acad. Nat. Sci. Phila., 1860, p. 566.

All of the species have seventeen longitudinal rows of scales. They differ as follows:

I. Tail one-fourth of total length or shorter; superior labial plates eight.

Rostral plate wider, more free laterally; temporal scales 2, 3, 4; bluish or yellowish, with a brown stripe on each side of a yellowish dorsal stripe.

S. grahamiae Baird and Girard.

Rostral plate narrower, less free laterally; temporal scales 2, 2, 3; olivaceous, with two brown stripes on each side of a narrow light brown dorsal stripe.

S. bairdii Jan.¹

II. Tail one-third total length; superior labial plates, nine.

Rostral plate narrower, less free at the sides; temporal scales 2-2-2. Yellowish, with two brown bands on each side of a dorsal stripe, anteriorly broken up into parallel narrow lines and crossed by brown crossbars near the head.

S. mexicana Duméril and Bibron.²

SALVADORA GRAHAMIÆ Baird and Girard.

Salvadora grahamiae BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 104.—BAIRD, U. S. Mex. Bound. Surv., II, 1859, Reptilia, p. 21, pl. v, fig. 2.—COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 72.—JAN, Icon. Gen. Ophid., Pt. 1, pl. III, fig. 2.

Phimothyra grahamiae COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 304; Check-list N. Amer. Batr. Rept., 1875, p. 38.

Zamenis grahami BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 393.

A dorsal ochraceous band or vitta, on each side of which a black one of the same width. Flanks yellowish green. Abdomen uniform dull yellow. Dorsal scales in seventeen rows; superior labials eight. Tail about one-fourth of total length.

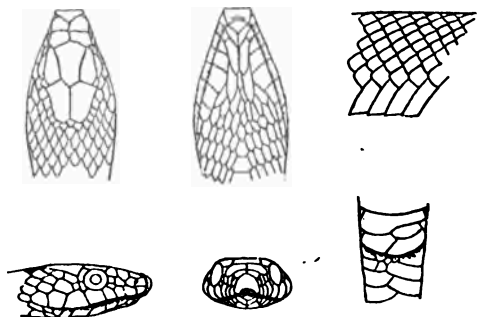


Fig. 183.

SALVADORA GRAHAMIÆ BAIRD AND GIRARD.

= 1.

White River Canyon, Arizona.

Cat. No. 10198, U.S.N.M.

Head conical, rostral plate very large, triangular, with edges free, appearing as if fastened on the outside of the snout after all the others had taken their place. Internasals proportionally large, forming the upper edge of the nostrils, and widely separated, for the two anterior thirds of their length, by the

rostral. Prefrontals but slightly larger than the internasals, like the latter, subrounded, longitudinally narrow, transversely elongated, and

¹ *Salvadora bairdii* Jan, Iconografia degli Ofidi, pl. III, p. 52. Specimens in U. S. National Museum from Orizaba, Vera Cruz, W. Tehuantepec, and Chihuahua, Sumichrast and Potts; and in Museum Academy of Natural Sciences of Philadelphia, from Jalapa, Vera Cruz, William Pease.

² *Salvadora mexicana* Duméril and Bibron, Cope, Bull. U. S. Nat. Mus., No. 32, 1887, p. 72. *Zamenis mexicanus* Duméril and Bibron, Erp. Gén., VII, 1884, p. 695. *Lytro-rhynchus mexicanus* Cope, Proc. Amer. Phil. Soc., 1869, p. 266. The last maxillary tooth is separated from the others, hence diacranterian.

produced slightly between the postnasal and the loreal, on the sides of the head. Frontal subpentagonal, much elongated, tapering posteriorly without being pointed. Parietals elongated, posteriorly truncated, sides rounded. Prenasal larger, subtrapezoidal; postnasal subquadangular; nostril situated at the anteroposterior angle of the postnasal. Loreal subtriangular, base in a horizontal line with the head; apex upwards produced between the postfrontal and the upper anteorbital. Oculars 2-2 or 3-2. Upper anteorbital large, angular, produced to the upper surface of the head between the superciliaries and postfrontals. Inferior anteorbitals small and quadrangular, lowest situated on the commissure between the fourth and fifth labials. Postorbitals angular, equal in size. Two pretemporals, shields somewhat larger than rest, which are scarcely larger than the scales. Mouth deeply cleft, undulating. Upper labials eight; seventh largest, the three anterior ones comparatively small. Lower labials not conspicuous, ten in number, fifth largest, the three posterior ones scarcely to be distinguished from the scales. Posterior pair of mental scutellæ much smaller than the anterior, extending to the middle of the fifth inferior labial. Symphyseal plate very small.

Body subcylindrical, elongated, tail subconical, tapering, forming about the one-fourth of the total length. Scales elliptical, disposed in seventeen rows; outer row somewhat broader, the rest slightly diminishing towards the dorsal region.

Surface of head brown. An ochraceous vitta extends from the occiput to near the end of the tail, embracing anteriorly three rows of scales, and posteriorly one row, and two adjoining halves to opposite the anus; on the tail it covers two half scales. On each side of this a brown vitta runs parallel, and covers the same number of scales anteriorly and posteriorly, except on the tail, where it is narrower, and embraces only half a scale. The antero-inferior margin of the scales in the black vitta is yellowish green. The remaining portion of the flanks, embracing four rows of scales, and the extremities of the scutellæ, is uniform yellowish green, with the bases of the scales blackish, as is also the skin. The abdomen is uniform dull yellow.

Sonora; gastrosteges, 180 + 1; urosteges, 97; total length, 28½ inches; tail, 7½ inches.

Considerable variations are presented by this species. Thus in four specimens (Cat. Nos. 4673, 4470, 14064, 17175) a narrow brown band extends along the fourth row of scales, in addition to the usual one on each side of the median line. In Cat. Nos. 4470, 2082 the superior stripe is partially broken into spots. In Cat. No. 9001 the bands are obsolete, being represented by blackish shades at the bases of the scales. Several specimens (Cat. Nos. 2082, 9101, 5347, 12638, 13811, 16339) have a small loreal below the usual one. In five (Cat. Nos. 2082, 4470, 9101, 13811, 16339) a second inferior ocular is formed from the summit of the fourth superior labial plate, so that the fifth only enters the orbit. On a specimen of this kind was proposed the *Phimothyra hexalepis*,

which has also wider brown dorsal stripes than any other individual. In Oat. Nos. 13811, 16339, and 17175 there are nine superior labials.

The *S. bairdi* resembles this species considerably, but has the rostral plate much narrower, and with more closely appressed edges, quite as the *S. mexicana*. One or more of the temporal scales of the inferior row is larger than in the *S. grahamiæ*. The colors are darker. The *S. mexicana* is a larger species than either of the others, and its general appearance is a mixture of the *Zamenis tæniatus* and the *Z. flagelliformis*. The head is longer and flatter than the other species, and the temporal scales are in four vertical rows, the upper row larger.

The *Salvadora grahamiæ* ranges from Guyamas, Sonora (Cragin), Batopilas, Chihuahua (Wilkinson), and Cape St. Lucas (Xantus), on the south, to Cottonwood Canyon, Utah, on the north. The locality given on the authority of Yarrow, "Ogden, Utah," in the following list, requires confirmation, as it is much further north than it is to be looked for.

Salvadora grahamiæ Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2080	1	Presidio del Norte.....	.....	Col. J. D. Graham, U. S. A	Alcoholic type.
2081	1	Sonora, Mexico.....	.....	do.....	do.
2082	1	do.....	.....	do.....	do.
4573	1	Fort Buchanan, Arizona.....	.....	Dr. E. J. D. Irwin, U. S. A	Alcoholic.
4960	1	Pecos River, Texas.....	.....	.....	do.
1787	1	Brownsville, Texas.....	.....	.....	do.
4470	1	Mohave Village, Arizona.....	.....	H. B. Mollhausen.....	do.
7894	1	Fort Whipple, Arizona.....	.....	E. Palmer.....	do.
8424	2	Southeast Arizona.....	Oct. —, 1873	H. W. Henshaw.....	do.
5347	1	Cape St. Lucas, L. California.....	.....	John Xantus.....	do.
9101	1	Cottonwood Cañon, Utah.....	— —, 1871	John Kohler.....	do.
8605	1	Fort Craig, New Mexico.....	— —, 1874	Dr. G. W. Boughter.....	do.
10716	1	Ogden, Utah.....	— —, 1878	Davis.....	do.
10196	1	White River Cañon, Arizona.....	— —, 1879	Dr. R. T. Burr.....	do.
1392	1	Indianola, Texas.....	.....	Col. J. D. Graham, U. S. A	do.
12637	3	La Pas, L. California.....	Feb. —, 1882	L. Belding.....	do.
12638	1	do.....	Feb. —, 1882	do.....	Alcoholic, junior.
10196	1	White River, Arizona.....	— —, 1879	Dr. R. T. Burr.....	Alcoholic, do.
13811	1	San Diego, California.....	.....	Rosa Smith.....	do.
16339	1	do.....	.....	C. R. Orcutt.....	do.
14064	1	Cameron County, Texas.....	.....	[?].....	
17175	1	Nogales, Arizona.....	.....	P. L. Jouy.....	

U.S.N.M. No.	Locality.	When collected.	From whom received.	Remarks.
18059	Argus Range, Shepherd Cañon, California.....	Apr. 26	Fisher.....	
18060	Argus Range, Manturango Spring, California.....	May 2	do.....	
18061	Amargosa Borax Works, California.....	Mar. 16	Palmer.....	1,000 feet above Amargosa River.
18062	Virgin River, near Bunkerville, Nevada.....	May 8	Merriam.....	

Catalogue No.	Locality.	From whom received.
17792-3	Fort Huachuca, Arizona.....	Wilcox.
20565	San Pedro River, Arizona.....	Mearns.
22201	Fort Huachuca, Arizona.....	Fisher.
17064	Cameron County, Texas.....	C. K. Worthen.
17144	Nogales, Arizona.....	P. L. Jouy.
17506	Mesa west of Tucson Range, Arizona.....	Herbert Brown.
22327	Quinlan Creek, Kerrville, Texas.....	Hy. Caudin.
16339	Valley de los Viagas, San Diego County, California.....	C. R. Orcutt.

PHYLLORHYNCHUS Stejneger.

Phyllorhynchus STEJNEGER, Proc. U. S. Nat. Mus., XIII, 1890, p. 151.

Head slightly distinct, short; tail short; palatine teeth present; dentition diacranterian; rostral plate greatly enlarged, with free lateral borders, and produced backward so as to separate the supranasals entirely; anal undivided; no scale pits; pupil vertical; two nasals; loreal present; supralabials not in contact with orbit; one pair of genials only.

This genus is a curious example of those snakes in which the rostral shows a most extraordinary development. In the present instance this shield resembles a thick leaf loosely attached to the front of the snout and turned over on top of the muzzle. It approaches very closely the *Lytorhynchus* Peters of the desert regions of North Africa and India, differing only in the greater posterior prolongation of the rostral shield. Two species are known, both from the Sonoran region. They differ as follows:

Scales keeled on posterior two-thirds of body; tail one-eighth of total length; about fifteen dorsal and no lateral spots *Ph. browni* Stejneger.
Scales all smooth; tail shorter, about one twelfth the length; about thirty dorsal spots and one or two rows of lateral spots *Ph. decurtatus* Cope.

PHYLLORHYNCHUS BROWNI Stejneger.

Phyllorhynchus browni STEJNEGER, Proc. U. S. Nat. Mus., XIII, 1890, p. 152.

Lytorhynchus browni BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 417.

Scales distinctly keeled on the posterior two-thirds of the body, in nineteen rows; four loreals; labials, six and nine; gasterosteges, one

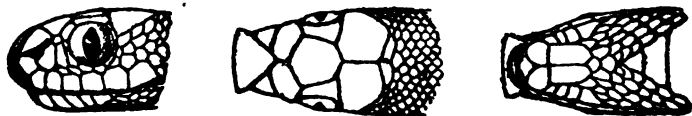


Fig. 184.

PHYLLORHYNCHUS BROWNI STEJNEGER.

X 15.

Tucson, Arizona.

Cat. No. 15719, U.S.N.M.

hundred and fifty-nine; anal entire; urosteges, thirty-one, divided; tail about one-eighth of total length; upper surface with about fifteen saddle-shaped brownish blotches on back and tail; no lateral spots. Rostral very prominent and broad, recurved on the top of the snout so as to separate the supranasals entirely and the prefrontals partially, with free lateral edges which are rather sharp and thin; lower side of rostral deeply concave; two prefrontals; frontal large, hexagonal, as broad as long; parietals scarcely longer than frontal, their width equaling their length; at their posterior border a broad but very short shield

with a median groove in continuation of the interparietal suture; nostril large, opening between the two large nasals and overhung by the prominent lower edge of the supranasal; the loreal proper high and narrow, surmounted by a small supraloreal which joins the supranasal, the upper preorbitals, and the prefrontals, being a detached portion of the latter; between the loreal proper and the supralabials two small subloreals; three preoculars, upper largest and not in contact with the frontal; two suboculars; four postoculars; three anterior temporals, upper largest; six supralabials, the two posterior largest (on the left side a narrow portion of the last is divided off anteriorly by a vertical suture not shown in the figure), none in contact with orbit; nine infralabials, the first five largest; mental triangular, with two well-defined concavities on the anterior border; only one pair of large, broad genaeal shields, with a straight anterior border joined in its whole length by the posterior border of the first infralabials, the lower border of the second infralabial only meeting the lateral border of the genaeal; a small scale wedged in between the genaeal and the fourth and fifth infralabials probably represents the second pair of genaeals. Scales

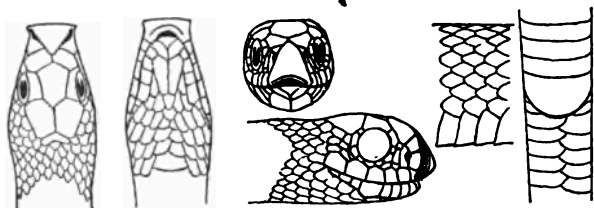


Fig. 185.

PHYLLORHYNCHUS BROWNI STEJNEGER.

× 2.

nearly equal, in nineteen rows, those on the anterior third of the body nearly smooth, but becoming gradually more distinctly keeled posteriorly; gasterosteges, one hundred and fifty-nine; anal entire; urosteges, thirty-one pairs. Tail rather blunt.

Dimensions.—Total length, 325 mm.; length of tail from anus, 42 mm.; proportion of tail to total length = 1:7.75.

Coloration (in alcohol).—White, with fifteen "seal brown" blotches on the back from head to tip of tail, becoming pale posteriorly; the first of these blotches, which begins three scale rows behind the parietals is of a uniform dark color, rather long and nearly hourglass-shaped, its anterior border being concave, and the antero-lateral corners produced to the angle of the mouth, and nearly meeting the posterior ends of a broad line of dark color which runs from the upper posterior labials on one side through the eye across the interorbital space down to the hinder labials on the other side; the other blotches are more or less square with rounded corners, the middle portion being lighter—the dark color only "powdered" over the white ground—with dark borders. The anterior and posterior borders wider than the lateral ones, the

white interspaces faintly "powdered" with brown on the sides; hinder supralabials with the posterior margin dark brown; lower surface uniform white.

This species differs in many important points from the previously described *Ph. decurtatus*, from Lower California. It is of stouter build, with a proportionately longer tail; the dorsal scales are decidedly keeled on the posterior two-thirds of the body, while in *Ph. decurtatus* they are all smooth; the number of gasterosteges is larger and the urosteges fewer; in *Ph. decurtatus* the rostral seems to be thicker, and the shields on the sides of the face are fewer; finally, the coloration is very different, *Ph. browni* having only fifteen dorsal blotches and no lateral spots, against double the number of dorsal blotches and very pronounced lateral spots in *Ph. decurtatus*.

Phyllorhynchus browni Stejneger.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
15719	1	Tucson, Arizona.....	Herbert Brown	Alcoholic.
19258	1	do	do	do.

PHYLLORHYNCHUS DECURTATUS Cope.

Phyllorhynchus decurtatus STEJNEGER, Proc. U. S. Nat. Mus., XIII, 1890, p. 154.

Phimothya decurtata COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 310; Bull. U. S. Nat. Mus., No. 1 (1875), pp. 38, 92.—YARBOW, Bull. U. S. Nat. Mus., No. 24 (1885), pp. 15, 99.

Salvadora decurtata GARMAN, N. Am. Serp. (1883), pp. 39, 145; Bull. Essex Inst., XVI, 1884, p. 25.—COPE, Bull. U. S. Nat. Mus., No. 32 (1887), p. 72.—BOCOURT, Miss. Sci. Mex., Rept., Pt. 11 (1888), p. 663.

Lytorhynchus decurtatus BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 417.

Scales smooth throughout, in nineteen rows; 2-3 loreals; labials six and nine; gastrosteges 172-177, anal entire; urosteges 26-27, divided;

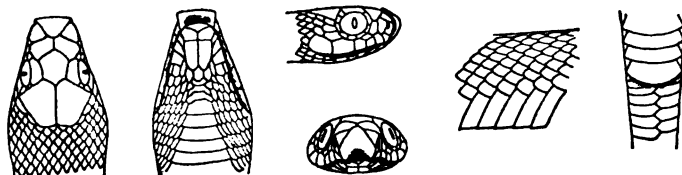


Fig. 186.

PHYLLORHYNCHUS DECURTATUS COPE.

× 1.5.

La Paz, Lower California.

Cat. No. 12639, U.S.N.M.

tail about one-eleventh of total length; upper surface with about thirty "amphicæolus" brown blotches on back and tail, alternating with a more or less double series of smaller spots of same color on the sides.

Rostral as in *Ph. browni*, but apparently thicker and not produced quite so far backward, as its posterior apex only just touches the suture of the prefrontals; under side of free lateral border of rostral very distinctly folded transversely; two prefrontals; frontal hexagonal, longer than broad; parietals as long as frontal and as long as broad; no shield behind parietals; nostril and nasals as in *Ph. browni*; loreal rather large, joining the prefrontal above, and meeting (on the right side) the second supralabial and a rather large subloreal below, which is wedged in between third and fourth supralabials, while on the left the upper portion of second supralabial is cut off so as to form a small second subloreal; three preoculars as in *Ph. browni*; two suboculars; three postoculars; two anterior temporals, on right side upper smallest, on left lower smallest; six supralabials, three posterior largest; infralabials and geneials as in *Ph. browni*; scales smooth, slightly decreasing in size toward the middle of the back, in nineteen rows; gastrosteges one hundred and seventy-seven; anal entire; urosteges twenty-six pairs.

Dimensions.—Total length, 350 mm.; length of tail from anus, 29 mm.; proportion of tail to total length=1:12.

Coloration (in alcohol).—Ground color whitish, with about thirty-two "chocolate brown" blotches on the back from neck to tip of tail; shape and size more or less irregular, but usually more or less concave in front and behind, pale in the middle, the brown color being merely sprinkled over the white ground; on the sides a row of smaller brown spots, two or three scales large, in a more or less double series, and, as a rule, alternating with the dorsal blotches; on the head a broad line from above each angle of the mouth running upward and forward through the eyes and meeting on the prefrontals; a few irregular spots on posterior portion of frontal, on parietals and anterior portion of neck, as well as on some of the supralabials; lower surface unspotted.

The above description is derived from the typical specimen, which was brought from the northern part of Lower California by Mr. William M. Gabb, and is preserved in the museum of the Academy of Natural Sciences of Philadelphia.

Another specimen is in the United States National Museum (Cat. No. 12639), and was collected by Mr. L. Belding at La Paz, near the southern extremity of the peninsula. According to Stejneger this specimen agrees with the type in all essential points. The scutellation is identical with the right side of the type (one subloreal only), except that there are three anterior temporals, lower largest; gastrosteges one hundred and seventy-two; urosteges twenty-seven pairs.

Dimensions.—Total length, 300 mm.; tail from anus, 28 mm.; proportion of tail to total length=1:10.7.

The coloration is also quite similar, the number of dorsal blotches being twenty-nine.

COLUBER Linnæus.

Coluber LINNÆUS, *Systema Naturæ*, 12th ed., p. 375.—BOIE, *Isis von Oken*, 1827, p. 209.—GÜNTHER, *Cat. Snakes Brit. Mus.*, 1858, p. 87.—COPE, *Check-list N. Amer. Batr. Rept.*, 1875, p. 39; *Proc. U. S. Nat. Mus.*, 1888, p. 390.—BOULENGER, *Cat. Snakes Brit. Mus.*, II, 1894, p. 24.

Calopeltis BONAPARTE, *Mem. Real. Acad. Torino* (2), II, 1840, p. 431.

Scotophis BAIRD and GIRARD, *Cat. N. Amer. Rept.*, Pt. 1, *Serpents*, 1853, p. 73.

Natrix COPE from LAURENTI, *Proc. Acad. Nat. Sci. Phila.*, 1862, p. 338; *Cat. Batr. Rept. Centr.-Amer. Mex.*, 1887, pp. 56-71.

Colubrid snakes with equal teeth, subcylindric body, and two rows of caudal scutellæ. The pupil round; the rostral and nine superior cephalic shields normal; two nasals and one preocular plates. Two pairs of genials; scales of the body with two apical pits, keeled or rarely, smooth. Preanal shield divided.

This genus embraces a number of species of the northern temperate regions of the world. Six species belong to Eurasia and ten to North America. Three others extend to within the tropics of Mexico and Central America.

The proper application of the Linnæan generic name *Coluber* only appears after considerable criticism of the work of the earlier writers on reptiles. The first author to use the name after Linnæus was Laurenti, in 1768, in his *Specimen Synopsis Reptilium*, published at Vienna. He includes in it ten species, of which eight can be determined. Of these, three are Viperidæ, one is a crotalid, and four are harmless snakes. All of the venomous and three of the harmless species bear Linnæan names, and all of them are members of the Linnæan genus *Coluber*. It remains to be determined for which of these types the name *Coluber* of Laurenti must be retained. The evidence is furnished by the author in the following foot-note attached to the generic character:

Colubri venenati abaque ulla injuria accepta ferocissime irruunt in hominem.

In the opinion of Laurenti the Colubri were poisonous, and this was probably due to the fact that the only species of his list with which he was acquainted by actual observation were the European vipers he included in it. The poisonous species are then the types of the *Coluber* of Laurenti.

The next author to use the name *Coluber* was Treviranus.¹ He indicated but one species, *C. natrix*. As this species is the type of the *Natrix* of Laurenti of 1798, it can not be used in that connection.

Oppel, in his work on Reptilia published in 1811, gave the following species under the genus *Coluber*:

C. melanocephala Linnæus.

C. cursor.

C. æsculapii Gmelin, Linnæus, 1788.

C. canus Linnæus.

C. viperinus Linnæus.

C. natrix Linnæus.

C. mycterizans Linnæus.

C. ibiboca.

C. cyaneus Linnæus.

C. carinatus Linnæus.

¹ *Biologie ad Philosophie d. Natur*, Göttingen, 1802.

Of these species the *C. cursor* and *C. ibiboca* are not Linnæan, and the *C. viperinus* and *C. natrix* belong to a genus which had been already established, the *Natrix* of Laurenti. We are therefore restricted to six species in our search for the type of the genus *Coluber*. They received generic names at the following dates:

- C. melanocephala*; *Tantilla* Baird and Girard, 1853.
- C. æsculapii*; *Coluber* Günther, 1858.
- C. canus*; *Pseudaspis* Cope, 1864.
- C. mycterizans*; *Passerita* Gray, 1825.
- C. cyaneus*; unidentified.
- C. carinatus*; *Herpetodryas* Boie, 1826.

Günther in 1858 selected the *C. æsculapii* as the type of *Coluber*, and to this species that generic name must be applied.

Mr. Garman, of Cambridge, has followed Duméril in using the name *Coluber* for the *C. constrictor* Linnæus. The way in which this conclusion has been reached is as follows:

The first author whom we have to consider is Fitzinger, whose *Neue Classification der Reptilien* appeared in June, 1826, in Vienna. Seventy-one species of *Coluber* are enumerated in this work (page 57), of which only twenty-two are of Linnæan origin, and to these we must therefore confine our attention. In the following list of them the names of the genera to which these species were successively referred is given, and the date of each:

- C. minervæ* (unidentified).
- C. typhlus*, *Ophiomorphus* Cope, 1862; *Xenodon* Boie and Schlegel, 1837.
- C. cyaneus* Linnæus (unidentified).
- C. constrictor*, *Bascanium* Baird and Girard, 1853.
- C. saturninus*, *Herpetodryas* Boie, 1826.
- C. reginæ*, *Liophis* Wagler, 1830.
- C. millaris* (unidentified).
- C. cobella*, *Ophiomorphus* Cope, 1862; *Liophis* Wagler, 1830.
- C. rhombeatus*, *Psammophylax* Wagler, 1830.
- C. domesticus*, the same as
- C. hippocrepis*, *Zamenis* Wagler, 1830.
- C. lineatus*, *Lygophis* Cope, 1862; *Dromicus* Bibron, 1853.
- C. pethola*, *Oxyrrhopus* Wagler, 1830.
- C. vittatus*, *Tropidonotus* Kuhl, 1826.
- C. æstivus*, *Herpetodryas* Wagler; Duméril and Bibron, 1853.
- C. scaber*, *Dasypellis* Wagler, 1830.
- C. ordinatus*, *Eutænia* Baird and Girard, 1853; *Tropidonotus* Kuhl, 1826.
- C. striatulus*, *Haldea* Baird and Girard, 1853.
- C. natrix*, *Tropidonotus* Kuhl, 1826.
- C. stolatus*, *Amphisma* Duméril, 1853; *Tropidonotus* Kuhl, 1826.
- C. saurita*, *Eutænia* Baird and Girard, 1853; *Tropidonotus* Kuhl, 1826.
- C. fasciatus*, *Tropidonotus* Kuhl, 1826.

The latest date only can be considered in this connection, since the names of genera are retained in accordance with the priority of date of each. The latest date at which species of this restricted division *Coluber* are referred to other genera is 1853. In that year four of them

were referred to genera distinct from *Coluber*, and of these genera three were newly established. These three are *Bascanium* Baird and Girard, *Dromicus* Bibron, and *Haldea* Baird and Girard. Now Duméril, who published the prodromous of his classification of the serpents in 1853, expressly retains the name *Coluber* for the *C. constrictor* of Linnæus, type of *Bascanium*. But as the *C. constrictor* is not included in the Oppelian genus *Coluber* of 1811, it can not be considered here at all.

Shortly after the appearance of the work of Fitzinger, Boie furnished a synopsis of his systematic work on reptiles.¹ He gives a list of thirty-five species of the genus *Coluber*, of which only six are Linnæan. Of these but three appear in the list from Fitzinger, given above. These are *C. cyaneus*, *C. hippocrepis*, and *C. constrictor*, thus restricting the name to the *C. constrictor*.

Soon after, however, Boie gave a list of the genera of snakes, with a typical species for each.² Here he cites the *C. elaphis* (*Elaphis quater-radiatus* Gmelin, Duméril and Bibron) of Europe as the type, and adds "u. v. a," meaning, *und viel andere*—species belonging to the genus. What these other species are may be derived from a perusal of a previous paper by Boie,³ where he describes three closely allied species from Japan, the whole belonging to the genus *Elaphis* of Duméril and Bibron, and one of them (*Coluber conspicillatus*) being a member of the genus *Coluber* of Günther. Dr. Günther has regarded this reference as an indication of the meaning of Boie in his use of the name *Coluber*, and this determination must stand on the ground of previous determination by Oppel.

The North American species are of inoffensive habits, but are destructive to birds and mammals. Some of them reach considerable dimensions, but they are exceeded in this respect by some of the species of the allied genus *Spilotes*. The *C. guttatus* and *C. rosaceus* are of brilliant colors.

The North American species are closely allied, and form gradations of characters which must be carefully estimated in order to learn the definitions. It is not difficult to distinguish the *C. vulpinus*, *C. guttatus*, and *C. emoryi*, but the group of which the *C. spiloides* is the type is more difficult to unravel. It embraces that species, *C. confinis*, *C. quadricittatus*, *C. obsoletus*, *C. frenatus*, and *C. lætus*. All the North American species (except possibly *C. confinis*, of which but one specimen is known) have twenty-seven rows of scales, some species (*C. vulpinus*) varying to twenty-five, and others (*C. emoryi*) varying to twenty-nine. The most important characters are the number of rows of scales which are keeled, and the length of the tail, as indicated by the number of urosteges. The coloration has a typical value, but displays many transitions, especially in the *spiloides* group.

¹ Bulletin des Sciences Naturelles, edited by Férussac, IX, 1826, p. 237.

² Isis von Oken, 1827, p. 982.

³ Idem, p. 209.

³ *Coluber triaspis*, Cope, Proc. Acad. Nat. Sci. Phila., 1866, p. 128; Belize.

keels on any of the dorsal series of scales, and in one of *C. emoryi* a few dorsal rows have faint traces of keels. In a specimen of *C. obsoletus* (Cat. No. 5503) there are but sixty urosteges, the smallest number known in any other individual being seventy-four. This is abnormal. The young of the *C. quadrivittatus* are strongly spotted, and closely resemble the *C. spiloides*, as is also the case with the young of the *C. guttatus*. In the young of *C. emoryi* there are seldom more than two scuta in the first row of temporals, the division into three being accomplished at a later stage of growth. The general result of these facts is that the *C. spiloides* is the primitive type from which the other species have been derived, some by one modification, some by another.

Günther retained the Linnæan name *Coluber* for this genus, as he was compelled to do in view of the use of it by his predecessors Boie and Fleming.

COLUBER CONFINIS
Baird and Girard.

Coluber confinis COPE,
Proc. U. S. Nat. Mus.,
XV, 1892, p. 631, 2.

Coluber latus BOULENGER,
Cat. Snakes Brit. Mus.,
II, 1894, p. 49.

Scopophis confinis BAIRD
and GIRARD, Cat. N.
Amer. Rept., 1853, p. 76.

Head short, wide, muzzle narrow. Rostral plate narrow, slightly projecting, little visible from above. Internals much smaller than prefrontals. Frontal longer than wide. Parietals large, longer than muzzle from frontal plate, truncate posteriorly. Loreal smaller than in other species, longitudinal. Preocular low, not reaching frontal. Superciliary not much narrowed anteriorly; postoculars two, subequal. Temporals larger than scales succeeding them, in three rows

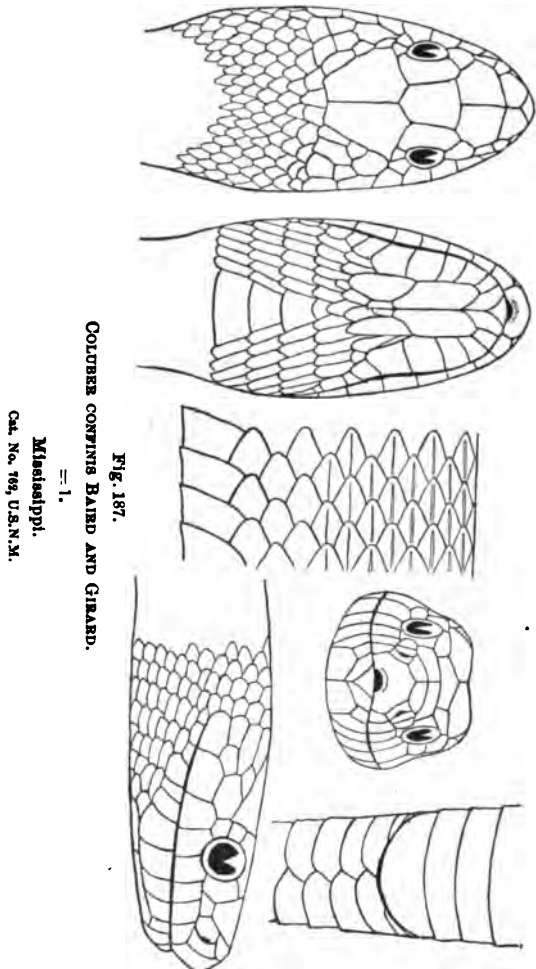


FIG. 187.
COLUBER CONFINIS BAIRD AND GIRARD.
= 1.

Mississippi.
Cat. No. 169, U.S.N.M.

of 1-2-3 scales on one side, and 12, 3-3 on the other. The first is a wide plate and different in form from what is found in the other species here described. Last superior labial large, nearly as high as the seventh, and little less elevated than the sixth. Postgenaeals smaller than pregenaeals. Scales in twenty-five rows, rather wide, the first row wider than the others; eleven median rows keeled, mostly quite distinctly.

Ground color (in alcohol) light yellowish, crossed above by thirty subquadrate brown spots, which have in some places very slight traces of a black border anteriorly and posteriorly. The spots are wider than long, except the anterior four spots, which are longer than wide. There is a series of rounded brown spots on the sides alternating with these, of which the anterior form are longer than deep, the first forming a short band. A very obscure series of spots on the ends of the gastrosteges alternates with the lateral spots. Toward the posterior part of the belly these become confluent, forming a dusky band on the upturned extremities of the gastrosteges, as in the *C. obsoletus*, and they form two parallel bands on the under side of the tail, a character more or less visible in other species. The nuchal dorsal spot sends anteriorly and posteriorly from its angles short bands, the anterior not reaching the parietal plate. There are no markings on any part of the head, which is of a uniform yellowish gray above, and cream color below and on the superior borders of the mouth.

When the skin of the upper surfaces is stretched, the dark color of the spots is seen not to cover the entire surface of each scale, forming longitudinal stripes, which are distinctly indicated in the spaces between the spots.

Cat. No. 762; gastrosteges, 243+1; urosteges, (†); scales, 25; total length, 1114 mm.; tail, (†).

This species resembles in color characters the *C. spiloides*, but is in its scutellation different from any other American species. The contracted muzzle with small rostral plate, and the very small loreal, together with the large temporals, are especial characters.

It is not absolutely certain that this is the *C. confinis* of Baird and Girard, the type specimen of which I have not been able to find. The description of those authors agrees with it in the number of rows of scales, and does not differ in any important respect from it. It was taken at Anderson, South Carolina.

Coluber confinis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
762 15338	1	Mississippi..... Prairie Mer Rouge, Louisiana.	†..... Dr. D. W. Prentiss.....	Alcoholic.

COLUBER VULPINUS Baird and Girard.

Coluber vulpinus COPE, Check-list N. Amer. Batr. Rept., 1875, p. 39.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 49.

Scotophis vulpinus BAIRD and GIRARD, Cat. N. Am. Rept., Pt. 1, Serp., 1853, p. 75.

Elaphis rubriceps DUMÉRIE and BIBRON, Erp. Gén., VII, 1854, p. 270.

Internasals much smaller than prefrontals. Rostral broad. Parietals broad, rather short, longer than the frontal shorter than the muzzle anterior to the frontal plate. Eyes center over the junction of the fourth and fifth labials. Upper labials eight, penultimate one the largest, last somewhat smaller; lower ten, sixth the largest. Anteriorly the first three or four rows of scales are smooth, then they are obso-

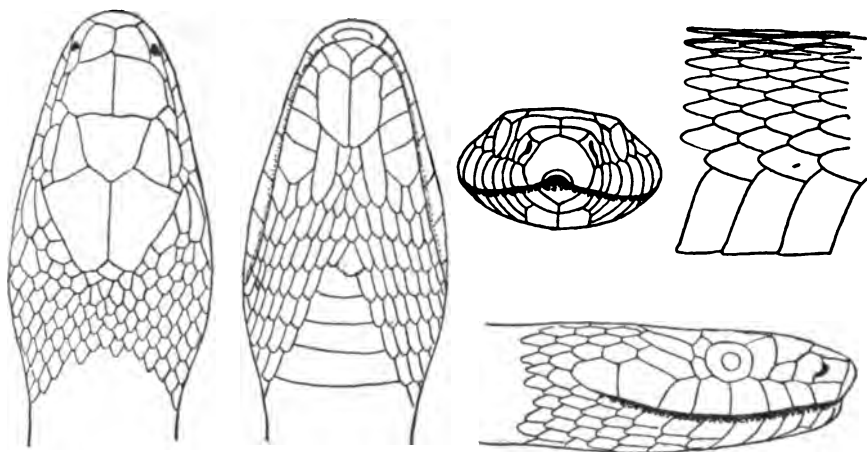


Fig. 168.

COLUBER VULPINUS BAIRD AND GIRARD.

= 1.

Racine, Wisconsin.

Cat. No. 7369, U.S.N.M.

letely carinated, then more so toward the back, although everywhere moderately so. Gastrosteges and urosteges less numerous than in the other American species.

Ground color above light-brown. A series of broad transverse quadrate chocolate blotches extending from head to tail, about sixty in number, forty-four to anus. The first spot anteriorly is divided into two on the nape, and occasionally the blotches anteriorly are irregular, oblique, and varying in size. This occurs, however, only on the anterior fifth of the body, behind which the intervals between the blotches are rectilinear, nearly equal, and about one and a half scales in length. The blotches are generally embraced between the fifth or sixth rows on each side, and are three to four scales long. The sides of the blotches are not linear, but obtuse-angled. On each side is a series of smaller rounded blotches on the 3d to 7th rows similar in color to those on the back, and like them with a black border, sometimes more or less interrupted. Another series of subquadrate black blotches, about the same

size as the last, is visible on the edge of the abdomen, sometimes involving the first and second rows of scales; these are opposite to the dorsal blotches. Rest of the abdomen yellowish-white, with alternating quadrate blotches of black. The brown color becomes lighter on the sides.

A second much larger specimen from Michigan has the ground color a yellowish-brown, and there is a black streak from the eye to the angle of the mouth; a second vertical stripe under the eye. The spots on the back are only about forty-five, of which thirteen belong to the tail.

This is the most robust species of the genus, and it reaches as large a size as any. Every character is consistent. The head is short, the parietal plates are short, the body is short, the tail is short, and the spots are short relatively to the other species of the genus.

Cat. Nos.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
1570	205 + 1.	68.	27.	1210	205
1620	196 + 1.	66.	25.		
1727	208 + 1.	55.	27.		
7269	217 + 1.	58.	27.		

This species is distributed over the northwest of the eastern district, not being known from east of Illinois or south of the mouth of the Missouri River.

Examination of the type specimen of the *Elaphis rubriceps* Duméril and Bibron shows that it belongs to the *C. vulpinus*.

Coluber vulpinus Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1570	1	Grosse Island, Michigan.....		Rev. C. Fox	Alcoholic type.
7269	1	Racine, Wisconsin.....			do.
2324	1	Rock Island, Illinois.....			do.
1727	1	Fort Snelling, Minnesota.....		Dr. Geo. Suckley, U. S. A.	do.
1729	1	do.....			do.
9613	1	Webster City, Iowa.....	—, 1878	Charles Aldrich.....	Alcoholic.
9927	1	do.....	—, 1878	do.....	do.
9613	1	do.....	—, 1878	do.....	do.
10759	1	(1).....			do.

Prof. O. P. Hay¹ writes of this species as follows:

The fox snake appears to be moderately common in some localities. It is often known as the "pilot snake," and is supposed to have some mysterious connection with the rattlesnake. It is a wholly innocent snake, although it seems a little inclined to be pugnacious. Dr. Suckley² states that one of these snakes was brought to him alive at Fort Snelling, Minnesota. When provoked it showed its irritation by vibrating the tip of its slender tail, which, when striking a crumpled leaf or any other small object, would produce a well-marked rattling noise, very similar to that made by the rattlesnake under the same circumstances. Other observers make mention of the same habit.

Mr. Robert Ridgway, of the Smithsonian Institution, writes me that, while hunting near Mount Carmel, Illinois, he came upon a fox snake over six feet in length. It immediately showed a disposition to fight, and Mr. Ridgway says it was the most

¹ Batrachians and Reptiles of Indiana, Seventeenth Ann. Rept. State Geol. Indiana, 1892, p. 499.

² Pacific R. R. Surv., XII, Pt. 2, p. 300.

viciously disposed snake that he had ever seen. An examination of the stomach showed that it had just swallowed a half-grown rabbit. Its disposition appears to be in strong contrast to that of *C. obsoletus*, which, so far as I have been able to learn, is very gentle.

These snakes, being wholly harmless and subsisting on vermin of various kinds, ought to receive the protection of the farmer.

COLUBER GUTTATUS Linnæus.

Coluber guttatus LINNÆUS, Syst. Nat., I, 1766, p. 385.—GMELIN, Linn. Syst. Nat., 13th ed., I, Pt. 3, 1788, p. 1110.—DAUBURTON, Quadr. Ovip. Serp., p. 602.—LACÉPÈDE, Quadr. Ovip. Serp., II, p. 329.—BONNATERRE, Ophiologie, p. 19.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 363.—SCHLEGEL, Essai Phys. Serp., 1837, p. 168.—HOLBROOK, N. Am. Herp., II, 1838, p. 109, pl. xxiv; 2d ed., III, 1842, p. 65, pl. xiv.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 89.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 39.—MERREM, Tentam., p. 99.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 39.

Scotophis guttatus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 78.

Elaphis guttatus DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 273.

Coluber compressus MERREM, Beiträge Naturges. Amphib., II, pl. 11.

Coluber carolinianus SHAW, Zool., III, p. 460, pl. 119.

Coluber maculatus LATREILLE, Hist. Nat. Rept., IV, p. 73.—HARLAN, Journ. Acad. Nat. Sci. Phila., 1827, p. 360.

Coluber pantherinus MERREM, Tentam., p. 102.

Coluber floridanus HARLAN, Journ. Acad. Nat. Sci. Phila., 1827, p. 360.

Two plates in the first row of temporals; parietal plate longer than muzzle measured from front of frontal plate. Scales in twenty-seven or twenty-nine rows, only five rows of scales, and these weakly. Eight superior labials, fourth and fifth entering orbit. Orbitals 1-2. Tail short, the scutellæ not exceeding seventy-one in number; gastrosteges 215 to 235.

Light reddish-brown, with angular brick-red spots above. Head with brick-red bands arranged *en chevron*, the angle anterior, with blackish borders. Below white, tessellated with black.

This handsome species is represented by two well-marked subspecies, which differ as follows:

Scales in 27 rows; head bands present; dorsal spots narrower, extending over ten to fifteen rows, and with one or two rows of lateral spots on each side... *C. g. guttatus*. Scales in 29 rows; head bands, excepting the postocular, wanting or rudimental; dorsal spots wider, covering 19-21 rows of scales; no lateral spots.... *C. g. sellatus*.

This species ranges the Austroriparian region east of the Mississippi River, and the Carolinian district of the Eastern, not, however, entering New Jersey. The subspecies *C. g. sellatus* is restricted to Florida. It is one of our most brilliantly colored species, and is of inoffensive manners. It is altogether terrestrial in its habits.

COLUBER GUTTATUS GUTTATUS¹ Linnæus.

Head elongated, outlines nearly straight, and tapering from the sides of the occiput to the subtruncate snout. Frontal large, longer than wide, pentagonal, with the lateral margins at a very slight angle with

¹ For synonymy see *Coluber guttatus* above.

each other. Parietals rather narrow, longer than muzzle from frontal. Eye moderate; center rather in advance of junction of fourth and fifth labials; orbit above the whole of these labials. Labials eight above, penultimate the largest; eleven below.

Body elongated, little compressed. Tail shorter than in any species, except *C. vulpinus*. Carination very obsolete, visible only on the five central rows, and there very indistinctly; not evident on the tail. Scales rather large, triangular, pointed, the exterior row little if any larger than the rest.

General color of body above light red, paler on the sides. Along the back a series of dorsal blotches, about forty-five in number, thirty-two from head to anus. These blotches anteriorly are longitudinally quadrate, gradually becoming transverse; in front they are concave before and behind, and with the corners produced longitudinally; exteriorly they are zigzag convex. The color of each blotch is a dark brick-red,

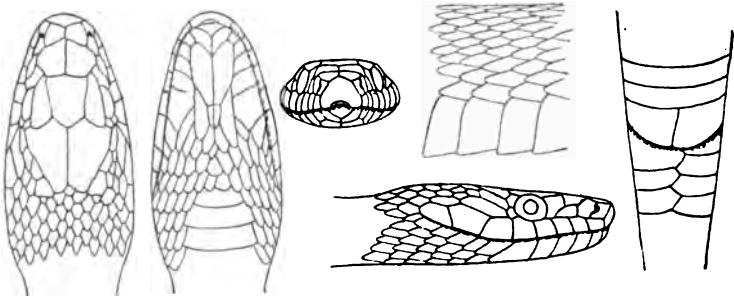


Fig. 189.

COLUBER GUTTATUS GUTTATUS LINNAEUS.

— 1.

Fort Morgan, Alabama.

Cat. No. 1600, U.S.N.M.

with a deep black margin half a scale wide. Exterior to the black is a lighter shade of the ground color. On each side of the dorsal series is a second alternating one of smaller elongated blotches, similarly constituted as to color. A third opposite to the dorsal occurs on the edge of the abdomen, and on the first to the fourth row of scales; in this the red is lighter, and the black is confined to a few scattered scales. The lateral blotches are more or less indistinct in places, and frequently confluent with each other and the dorsal series. Posteriorly, too, they are reduced more or less to the black marks in single scales. Color beneath yellowish white, with subquadrangular blotches of black, generally occupying half of the inferior surface of the abdominal scutellæ.

The ground color of the sides extends up on the forehead in the form of a frontlet, which crosses the vertical at its anterior extremity, passes backward along the top of the head, including the superciliaries and outside of occipitals, crosses above the angle of the mouth, and runs into the sides of the neck. This is narrowly margined on both edges

with black. A second frontlet across the front of the postfrontals, narrower but similar, and bending down on each side to the anteorbital. A similarly colored blotch on the commissure of the occipitals, widening behind and constituting a center to the dark-red space inclosed by the large frontlet on the back of the neck; behind the one just mentioned is another rather larger, and the two are sometimes confluent. A dark-red stripe is included between the two frontlets just described, crossing the posterior part of the postfrontals, the upper end of the anterior frontals, and through the eye, across the angle of the mouth down the sides of the neck. Vertical edges of the upper and lower labials black.

Specimens from Kemper County, Mississippi, much larger in size, agree exactly in the pattern of coloration. The red is, however, more or less effaced, probably by the alcohol. The blotches are light hazel, and the interspaces light chocolate.

Smaller specimens from Georgia differ only in having the blotches dark hazel, lighter centrally. The intervals are ash gray.

Cat. Nos.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
457.....	218 + 1.	67.			
1600.....	213 + 1.	71.	27.		
1612.....	221 + 1.	70.	27.	790.	158.
2359.....	219 + 1.	67.	27.		
8366.....	230 + 1.	64.	27.		
8799.....	227 + 1.	66.	27.		

Coluber guttatus Linnæus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1564	1	Kemper County, Mississippi.		D. C. Lloyd.....	Alcoholic.
1612	1	Somerville, North Carolina		J. C. McNair	do.
2193	1	Roanoke, Virginia			do.
2359	1	Madison, Virginia		Dr. W. A. Hammond, U. S. A.	do.
467	1	Roanoke, Virginia			do.
4732	1	Micanopy, Florida			do.
1615	1	Indian River, Florida.			do.
5508	1	Florida		G. Wurdemann	do.
1600	1	Fort Morgan, Alabama			do.
1621	1	St. Simons Island, Georgia		Prof. C. B. Adams	do.
4295	1	Arkansas			do.
8799	1	Augusta, Georgia	— —, 1878	William Phillips	do.
2342	1	Warren, Mississippi			do.
8366	1	Little Sarasota Bay, Florida.	— —, 1875	Prof. F. B. Meek	do.
9663	1	Arlington, Florida	May —, 1878	G. Brown Goode	do.
12018	1	Mount Carmel, Illinois	Nov. —, 1881	L. M. Turner	do.
457	1				do.
9587	1	Arlington, Florida	— —, 1878	G. Brown Goode	Cast.
13688	1	Georgiana, Florida		Wm. Wittfield	Alcoholic.
11991	5	do		do.	do.
10588	1	Clearwater, Florida	July 14, 1879	S. T. Walker	do.
9601	1	Arlington, Florida	Apr. —, 1878	G. Brown Goode	do.
14330		Georgiana, Florida		William Wittfield	
16285		Wheaton, Montgomery County, Maryland.		Zoological Park	
19484		U. S. Insane Asylum, District of Columbia.		Dr. I. W. Blackburn	

This species ranges over the southern half of the eastern district of the United States, east of the Mississippi River.

COLUBER GUTTATUS SELLATUS Cope.

Coluber guttatus sellatus COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 387.

This subspecies does not differ in any structural character from the typical *C. guttatus guttatus*, excepting that the scales are in twenty-nine longitudinal rows. The value of this point is uncertain, as but three specimens are known. The essential differences are seen in the color. The headbands so conspicuous in the *C. g. guttatus* are wanting here, except the postocular, which is present, and is black-banded above and below. The parietal band is indicated by a black external border, which extends to the edge of the parietal plate. It is further faintly indicated by a shade, which joins that of the opposite side, on the front of the frontal scutum. A second character is seen in the absence of lateral spots on the body, their places being clear pink or yellowish, like

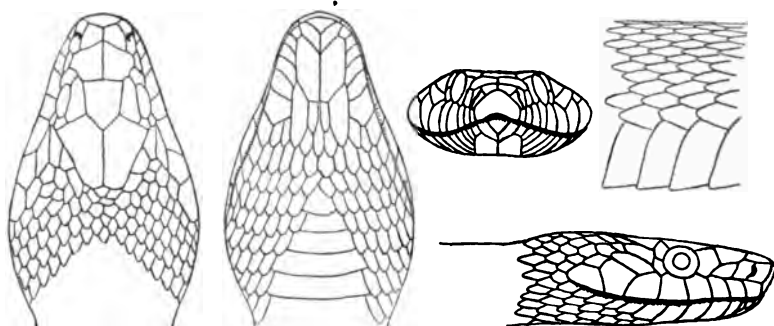


Fig. 190.

COLUBER GUTTATUS SELLATUS COPE.

= 1.

Palatka, Florida.

Cat. No. 6507, U.S.N.M.

the ground of the belly. The spaces between the dorsal spots and those between the lateral clear spaces are gray dusted. The scales at the superior edge of the lateral pale spots are sometimes black-bordered, partially outlining a lateral spot. This is most distinct anteriorly, where these borders form interrupted longitudinal lines. The dorsal spots are red and have narrow serrate black anterior and posterior borders. The spots are wider than in the *C. g. guttatus*, covering nineteen and twenty-one longitudinal rows of scales, while in the former they cover but from ten to fifteen rows of scales. The belly is tessellated with black spots, as in *C. g. guttatus*, each spot covering the external half of two or three gastrosteges. A delicate black line connects them externally, running along the angle of the gastrosteges.

Cat. Nos.	Gastrosteges.	Urosteges.	Scales.	Length.	Tail.
				mm.	mm.
9692.....	237 + 1.	64.	29.	918.	173.
6507.....	234 + 1.	65.	29.		

This subspecies inhabits the entire peninsula of Florida, along with the typical one, which displays its full characters in the same region. The *C. g. sellatus* is evidently annectent to the *C. rosaceus* of southern Florida.

Coluber guttatus sellatus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
9892	1	Arlington, Florida.....	G. Brown Goode.....	Alcoholic.
8507	1	Palatka, Florida.....	Dr. Bean.....	do.
14836	1	Cape Sable, Florida.....	Lieut. J. F. Moser.....	do.

COLUBER ROSACEUS Cope.

Coluber rosaceus COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 388, pl. xxxvi, fig. 3.

Coluber letus? BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 49.

Head oval, distinct from body. Rostral plate visible from above; internasals much shorter than prefrontals. Frontal wider than in

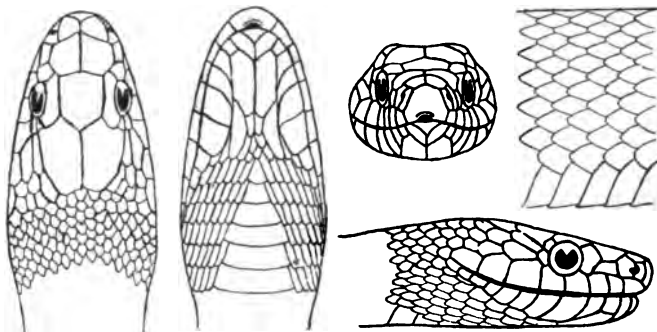


Fig. 191.

COLUBER ROSACEUS COPE.

= 1.

Key West, Florida.

Cat. No. 14418, U.S.N.M.

allied species, as broad as it is long, with straight anterior border. Parietals longer than muzzle from frontal plate. Loreal longer than high; preocular not reaching frontal, but separated by the very narrow anterior extremity of the superciliary. Temporals 2-3-4, the posterior small. Scales of body smooth, rather wide, the first row a little wider than the second. Postgenaeals smaller than pregenaeals, but distinct from gular scales. Gastrosteges bent up at the sides. Tail probably long as in *C. quadrivittatus*, but the end is lost. The urosteges remaining number 47.

The ground color of the superior surfaces, in the rather fresh alcoholic specimen, is buff, each scale with a dusky band within and parallel to the border, surrounding a buff center. This band may be broken up into spots. The greater part of the superior surfaces is occupied by a series of vermilion-tinted pink spots, which extend across the back to within two or three scales of the gastrosteges, thus

covering from twenty-one to twenty-three scales transversely. Their length covers six scales everywhere, though as the scales are more elongate anteriorly the spots are also more elongate. The lateral spots of other species are represented by pale tracts continuous with the light yellow of the belly, which alternate with the dorsal spots, extending to an apex on the fourth or fifth row. In other words the cross bands of dusky ground-color bifurcate on the flanks, and terminate at the extremities of the gastrosteges. Below their termini at the lateral angle of the gastrosteges is a short longitudinal black bar or spot crossing one or two gastrosteges. This represents the black line which occupies a similar position in the *C. guttatus*. At the anterior and posterior parts of the body the dorsal spots have short serrate anterior and posterior borders.

Four indistinct longitudinal bands traverse the length of the body on the fourth and fifth and tenth and eleventh rows of scales on each side. The inferior band is very obscure, especially anteriorly, and both are less distinct on the true skin than on the epidermis.

The head is of a reddish color above; below, yellowish. A faint dusky band extends across the temporal region and parts of the superciliary and frontal plates, meeting a corresponding one of the opposite side. This represents the space between the bands of the *C. guttatus*, which consist in this species of ground color only. Superior and posterior margins of upper labials obscurely dusky.

Cat. No. 14418; gastrosteges, 239 + 1; urosteges, (†); scales, 27; total length, 970 mm.

This beautiful species is of considerable interest from the intermediate position it occupies between the *C. guttatus* and the *C. quadrivittatus*. The absence of keels of the scales and the dorsal color spots ally it to the former, and especially to the subspecies *C. g. sellatus*; but the absence of lateral and ventral spots and head bands and presence of longitudinal stripes ally it to the latter. The width of the frontal plate is also characteristic. It is a very handsome animal.

Coluber rosaceus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
14418	1	Key West, Florida	Henry Hemphill	Alcoholic.

COLUBER QUADRIVITTATUS Holbrook.

Coluber quadrivittatus HOLBROOK, N. Amer. Herpt., III, 1842, p. 89, pl. xx.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 88.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 39.

Coluber obsoletus BOULENGER, part, Cat. Snakes Brit. Mus., II, 1894, p. 50.

Scotophis quadrivittatus BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 80

Elaphis quadrivittatus DUMÉRIL and BIEBON, Erp. Gén., VII, 1854, p. 265.

Body slender, tail very slender, about the fifth of the total length. Head elliptical, well distinguished from the body by a slender neck.

Eyes large. Frontal plate pentagonal, slightly concave on the sides, equalling in length the commissure of the parietals. The lower portion of the anterior orbital is narrower than in *S. latus*. Loreal trapezoidal. Two elongated and small temporal shields in the first row. Upper labials eight, seventh largest; lower labials ten, fifth largest. Rostral hexagonal. Scales very thin, lozenge-shaped, in twenty-seven dorsal rows. Slight traces of carination may be observed on the five or eight medial rows. The outer row is composed of scales as high as long; in the second row they are perceptibly larger than the remaining ones.

Ground-color above creamy yellow to brownish gray, with four longitudinal brown bands, covering each one entire row of scales and the half of the adjoining rows. The lateral bands thus extend along the

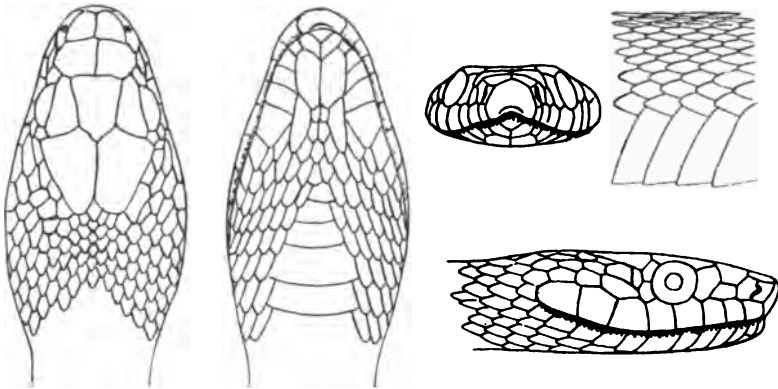


Fig. 192.

COLUBER QUADRIVITTATUS HOLBROOK.

= 1.

Arlington, Florida.

Cat. No. 9691, U.S.N.M.

third, fourth, and fifth rows, the fourth being the one entirely covered. The dorsal bands extend along the tenth, eleventh, and twelfth rows, the eleventh being entirely covered. The space between the dorsal and lateral band embraces four entire rows of scales, and the half of the adjoining ones. The dorsal space between the dorsal bands comprises three entire rows of scales and the half of the adjoining rows. The abdomen, head, and tail beneath are light straw-color with obscure traces of gray spots. On the removal of the epidermis the dark bands disappear to a considerable extent, and then indistinct and obsolete quadrate spots become visible on the sides, and on the back, the latter occupying the space between the median pair of bands. The edges of many of the scales are lighter.

These spots are distinct in young specimens, and disappear with advancing maturity.

Cat. Nos.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
4709	245 + 1.	100.	25.	905.	245.
9691	242 + 1.	90.	27.		
12626	233 + 1.	94.	27.		
1597	238 + 1.	102.	27.		
1594	232 + 1.	93.	27.		
6406	238 + 1.	87.	27.		
13778	237 + 1.	86.	27.		

An instructive series of the young of this species was sent to the U. S. National Museum by William Wittfield from Georgiana, Brevard County, Florida. They number nineteen specimens, and show how a longitudinally banded snake is developed from a spotted one. The specimens may be divided into three lots, the first including Cat. Nos. 13650, 13652, 13668, 13669, 13678, 13689, 13696, and 13706. These are the smaller specimens, the smallest measuring 325 mm., and the largest 380 mm. The dorsal region is marked with brown spots on a light ground, and there is a series of smaller spots alternating with them on each side, with a trace of a second series of spots alternating with the last on the ends of the gastrosteges. The dorsal spots have concave anterior and posterior borders, so that the angles of one spot approximate those of the adjacent ones. There are forty-two spots between the nape and vent. The angles of the nuchal spot are produced so as to form short bands, the anterior reaching to near the parietal scuta. There is a narrow brown postocular band, and a narrow one across the front on the posterior part of the prefrontal plates. The lateral spots of the body are elongate in front, the first forming a longitudinal line on the side of the neck. The gastrosteges are spotted at the ends, and the middle portions are clouded in some of the specimens.

In this stage these specimens are closely similar to the *O. spiloides*, except that the spots in the latter species are less numerous, ranging from 30 to 35 on the body. They can not be distinguished by the increased number of keeled rows of scales, as the keels are less evident in the young than in the adult.

The second set of specimens measure from 460 to 580 mm., and embraces Cat. Nos. 13646, 13657, 13681, 13703. Here the lateral angles of the dorsal spots are connected by a faint longitudinal stripe, thus forming the superior pair of stripes of the adult; and the lateral spots show a trace of a similar connection on the anterior part of the body. The marks on the head are present as in the smaller specimens, or they are broken into spots or are nearly absent. The clouded marks of the belly are present or absent.

The third set varies from 580 to 620 mm., and includes Cat. Nos. 13656, 13670, 13675, 13686, 13691. Here the lateral stripe is fairly distinct, and the head and belly are immaculate. Traces of the dorsal and lateral spots may be distinctly seen.

Associated with these specimens from the same locality is a young *C. guttatus* of 550 mm. length. It displayed all the characters of the adult, and does not vary in the direction of the *C. spiloides*, as do the young of the present species.

Coluber quadrivittatus Holbrook.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
13778	1	Punta Rosa, Florida.....		C. W. Ward.....	Alcoholic.
4709	1	Micanopy, Florida.....		Prof. L. Agassiz.....	Alcoholic type.
1586	1	Georgetown, South Carolina.....			do.
1594	1	Society Hill, South Carolina.....			do.
1597	1	St. Simons Island, Georgia.....			do.
13646	17	Georgiana, Florida.....	Dec. —, 1883	William Wittfield.....	do.
1898	1	St. Simons Island, Georgia.....			do.
6406	1	Newbern, North Carolina.....			do.
5504	1	Palatka, Florida.....			do.
9691	1	Arlington, Florida.....	May —, 1878	G. Brown Goode.....	do.
11983	4	Georgiana, Florida.....		William Wittfield.....	do.
10670	1	Gainesville, Florida.....	—, 1880	James Bell.....	do.
12826	1	do.....	—, 1880	do.....	do.
9602	1	Arlington, Florida.....	April —, 1878	G. Brown Goode.....	Cast.
11983	6	Georgiana, Florida.....		William Wittfield.....	Alcoholic.
10668	1	Gainesville, Florida.....	—, 1880	James Bell.....	do.
10669	1	do.....	—, 1880	do.....	do.
10672	1	Arlington, Florida.....	—, 1879	F. C. Goode.....	do.
11396	2	Gainesville, Florida.....	April 7, 1881	James Bell.....	do.
9602	1	Arlington, Florida.....	April —, 1878	G. Brown Goode.....	do.
14832		Georgiana, Florida.....		William Wittfield.....	do.
22370		Orange Hammock, De Soto County, Florida.....		William Palmer.....	do.
22694		do.....		R. Ridgway.....	do.

The habitat of this species is the southeastern quarter of the Austro-riparian subregion and the Floridan subregion. Its western range is not yet certainly defined. It does not occur in Kansas and Utah, as stated by Yarrow.

COLUBER SPILOIDES Duméril and Bibron.

Coluber spiloides DUMÉRIL and BIBRON, *Erp. Gén.*, VII, 1854, p. 269.—GÜNTHER, *Cat. Col. Snakes Brit. Mus.*, 1858, p. 901.

Coluber obsoletus BOULENGER, *part. Cat. Snakes Brit. Mus.*, II, 1894, p. 50.

Coluber obsoletus confinis COPE, *Check-list N. Amer. Batr. Rept.*, 1875, p. 39.

Coluber obsoletus spiloides COPE, *Proc. U. S. Nat. Mus.*, XI, 1 88, p. 387.

Head large, broad; neck and body compressed. Posterior frontals large; anterior considerably smaller; occipitals broad, large. Eye rather large; center over the line joining the fourth and fifth labials; orbits above the whole of the fourth and fifth labials. Upper labials eight, penultimate the largest, last one large; inferior twelve or eleven, posterior small. Nostrils nearly terminal. Rostral rather wide.

Scales rather short. Outer six rows smooth, seven to eleven median rows obsoletely carinated. Exterior row rather larger, rest nearly uniform.

Ground color ash-gray. A series of from thirty to thirty-five dorsal blotches, and twelve on the tail. These blotches are dark chocolate-

brown, with obsolete black margins. They are included between the sixth and seventh rows on each side, and about six scales long. They are very regular in shape, longitudinally quadrate, rather wider transversely in the middle, and with the corners slightly produced longitudinally. The gray intervals are thus not quite rectilinear, rather elliptical, but of the same width throughout. On the second, third, fourth, and fifth lateral row is a second series of similar blotches, more or less elongated, especially anteriorly. On the side of the neck, indeed, the blotches are confluent into very narrow distinct stripes. A third series of square blotches on the side of the abdomen, involving the first and second lateral rows. Rest of belly yellowish white, with black blotches; anterior eighth immaculate. A black stripe from the posterior part of the orbit to the angle of the mouth, which it reaches on the anterior extremity of the last labial. A vertical line beneath the

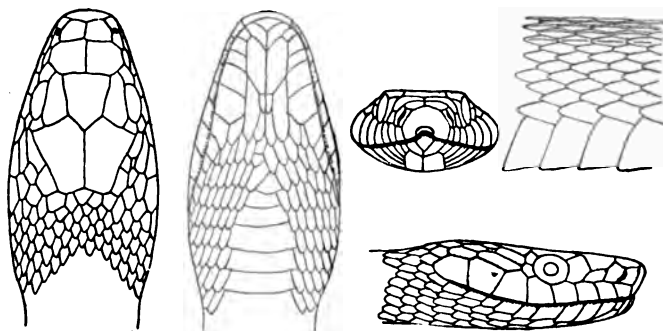


Fig. 193.

COLUBER SPILOIDES DUMÉRIL AND BIBRON.

= 1.

Monticello, Mississippi.

Cat. No. 7266, U.S.N.M.

eye, and the edges of the labials in front also black. Some blotching on the top of the head, which is too indistinct to define and is sometimes entirely wanting.

Compared with *S. vulpinus* the eyes are larger, the parietal plates longer, the nostrils more anterior, the carination more obsolete. Body more elongated. Abdominal scutellæ more numerous. Spots longitudinal, not transverse. Scales shorter, broader, more obtusely angular.

This species is closely allied to *S. guttatus*, but is quite distinct. Its full characters can best be seen in larger specimens; the young are more easily confounded with those of *S. guttatus*.

Cat. Nos.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
1570.....	237 + 1.	96.	27.		
1604.....	240 + 1.	82.	27.	765	172.
1616.....	241 + 1.	85.	27.		
5500.....	244 + 1.	80.	29.		
8981.....	242 + 1.	81.	27.		
14094.....	239 + 1.	90.	27.		

In young specimens of this species (as Cat. Nos. 8981, 14094) the keels of the scales are very obscure, or absolutely wanting, even up to a length of 430 mm. (Cat. No. 14094, Texas). The brown prefrontal and postocular bands are also very distinct, but there is no trace of the parietals. With increasing age the marks become obscure, or disappear altogether, and the abdominal spots become less distinct. Apart from the wide head and compressed neck and body, the young of the *C. spiloides* can only be distinguished from that of the *C. quadrivittatus*, by the greater strength of the colors and the smaller number of the dorsal and lateral spots in the former.

The number of temporal scales varies much in the *C. spiloides*. There are usually three vertical rows, but sometimes there are four, and even five. In the latter case a large scale of the labial or parietal border covers two rows.

The habitat of this species is the entire Austroriparian subregion.

Coluber spiloides Duméril and Bibron.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1583	1	Anderson, South Carolina	Miss C. Paine	Alcoholic type.
7266	2	Monticello, Mississippi	Miss H. Tunison	Alcoholic.
1616	1	Northampton County, North Carolina.		do.
1579	1	do		do.
1004	1	Tallahassee, Florida		do.
5500	1	Grand Coteau, Louisiana		do.
1570	1	Pensacola, Florida		do.
8981	1	Kinston, North Carolina	J. W. Milner	do.
5505	1	Independence, Missouri		do.
14660	1	Wheatland, Indiana	D. Ridgway	do.
14094	1	Texas	G. H. Ragsdale	do.
8981	1	Kinston, North Carolina	J. W. Milner	do.
1579	1	Hampshire County, North Carolina.		do.
1570	1	Pensacola, Florida		do.
1616	1	Hampshire County, North Carolina.		do.
5500	1	Grand Coteau, Louisiana		do.

Mr. Morris Gibbs sent me a specimen from Kalamazoo, Michigan, which is the most northern locality known.

Professor Hay¹ thinks that this species is a color form of the *C. obsoletus*. He bases this conclusion on the spotted coloration of the young of the latter, but I do not find this to be a valid argument. The young of *C. quadrivittatus* are spotted much as in the *C. spiloides* and some *C. obsoletus*. The range of the *C. spiloides* is less extensive than that of the *C. obsoletus*, which includes the Eastern subregion.

This is the only one of our North American snakes which displays the compressed body which is not uncommon in the Colubrine snakes of the tropics. This character distinguishes it from the other members of the genus found within our limits, but is shared by the *C. triaspis* Cope, of the Central American fauna. This peculiarity implies more or less climbing habits, and I suspect that when the *C. spiloides* is better known it will be found to climb on bushes and low trees.

¹ Seventeenth Ann. Rept. State Geol. Indiana, 1892, p. 502.

COLUBER OBSOLETUS Say.

Coluber obsoletus SAY, in Long's Exped. Rocky Mts., I, 1823, p. 140.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 347.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 39.

Scotophis obsoletus KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 330.

Coluber allegheniensis HOLBROOK, N. Amer. Herpt., I, 1836, p. 111, pl. xx; 2d ed., III, 1842, p. 85, pl. XIX.

Scotophis allegheniensis BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 73.

Elaphis allegheniensis ALLEN, Proc. Bost. Soc. Nat. Hist., XXII, 1868, p. 181.

Elaphis holbrookii DUMÉRI, Erp. Gén., VII, 1854, p. 272.

Scotophis lindheimeri BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 74.

Two plates in the first row of temporals; eight superior labial plates. Parietal plate longer than, or equal to, length of muzzle from front of frontal plate. Scales generally in twenty-seven rows, seventeen rows keeled; tail long, scutellæ not exceeding ninety-two; gastrosteges from about two hundred and thirty to two hundred and forty-five.

Black or brown above, with or without darker subquadrate spots; head not banded; belly very darkly clouded.

This somewhat variable species is represented by two subspecific forms, one of which shows affinity to the *C. quadrivittatus*. They differ as follows:

Spots when visible on the very dark ground distinct; a row of obscure spots on each side of them	<i>C. o. obsoletus</i> .
Ground light brown above, marked by square, dark-brown spots, which are connected at the angles, forming a longitudinal stripe; no lateral spots, but a broad, dark stripe, 4-6 scales wide	<i>C. o. lemniscatus</i> .

This species ranges throughout the entire Austroriparian region from the Rio Grande, and the Eastern, excepting only the Hudsonian district. The form *C. o. lemniscatus* is restricted to the Gulf States, but the *C. o. obsoletus* extends as far north as Mount Tom, Massachusetts, on the Connecticut River, according to Dr. J. A. Allen. Dr. Holbrook records it from the Highlands of the Hudson River, New York. Professor Verrill does not enumerate it among the species taken near Norway, Maine.

This species is not rare in the Middle States. It is, like other members of the genus, of very inoffensive habits, and is useful in reducing the numbers of the small Mammalia. It is much less active than the *Zamenis constrictor*, which it resembles in nothing but color. It is known as the Mountain Black Snake, or Pilot Snake.

COLUBER OBSOLETUS OBSOLETUS: Say.

Parietals moderate, their commissure equal in length to the frontal. Orbits moderate, above the fourth and fifth labials, center about midway between the snout and angle of the mouth. Anterior orbital large, extending nearly to the outer angle of the vertical. Loreal trape-

¹ For synonymy see *Coluber obsoletus*, above.

zoidal, highest anteriorly, nasals moderate. Labials eight above, moderate, posterior small, twelve below; posterior very small, sixth and seventh largest. Nine rows of scales between labials and abdominal scutellæ at the angle of the mouth. Outer three to seven rows smooth, then carinated very obsoletely, and then more decidedly and in increasing degree toward the back.

Color above black or dark lead color, marked by a dorsal series of quadrangular blotches, about thirty-four from head to anus, rather acutely emarginate before and behind, occupying a width equal to about fifteen scales. The lozenge-shaped intervals between these blotches are from two to three scales long centrally, diminishing and becoming more linear posteriorly. On each side, and alternating with the dorsal series is a second alternating one, composed of subrectangular elongated blotches, and alternating again with these is a second indistinct series along the edge of the abdomen. The entire system of coloration is very difficult to define, the general appearance being that of a blacksnake with irregular obsolete mottlings of white. The intervals between the blotches may be indicated as being white, with the center and apex of each scale lead color, the proportion of the latter being very small on the sides and increasing to the dorsal line.

The scales in the centers of the blotches have the basal half narrowly margined with white, as is the case, to some extent, with the lateral spots. Beneath greenish-white, with the centers of the scutellæ mottled with dark slate-blue, increasing backward. Chin and throat immaculate yellowish-white, scales on the sides with a bluish spot on the apex.

The colors described are those as preserved in alcohol. The color of the animal when alive is, at least in individuals from west of the Mississippi and Texas, red in the markings, which are white in spirits.

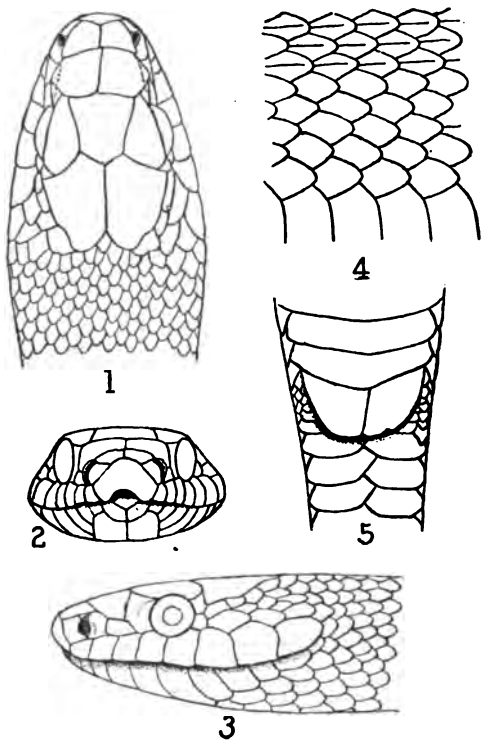


Fig. 194.

COLUBER OBSOLETUS OBSOLETUS SAY.

: 1.

Carlisle, Pennsylvania.

Cat. No. 1569, U.S.N.M.

In the general obsolescence of the markings the blotches may sometimes be detected as more or less confluent between the different series.

In two other specimens, Cat. Nos. 10578, 10651, the belly is nearly uniform yellowish; the black of the upper parts is replaced by umber-brown. The blotches are visible, but very obsoletely.

Cat. Nos.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
1734.....	234 + 1.	89.	27.		
1569.....	232 + 1.	86.	27.	1305.	275.
1601.....	{ 238 + 1.	78.	25.		
	{ 242 + 1.	?	27.		
2260.....	237 + 1.	?	27.		
2421.....	232 + 1.	80.	27.		
2432.....	246 + 1.	92.	25.		
5502.....	243 + 1.	79.	27.		
5503.....	231 + 1.	60.	27.		
10389.....	235 + 1.	84.	27.		
10651.....	224 + 1.	74.	25.		
10578.....	246 + 1.	78.	27.		

This species shares with the *C. vulpinus* the distinction of reaching a larger size than any other member of the genus.

This species is found over the entire Eastern district of the United States. It is gentle in its disposition and sluggish in its movements.

In the few specimens in which the lateral spots may be discriminated they are seen to be of elongate form, with few exceptions (such as Cat. No. 2421, Louisiana). In some specimens they are so elongate as to form a narrow lateral band for a short distance anteriorly, as in two specimens from Wheatland, Indiana (Cat. Nos. 10578, 10651). Such forms prepare us for the subspecies *C. o. lemniscatus*. In the Texan specimens, referred to a distinct species under the name of *S. lindheimeri*, the ground color is lighter, and the spots are distinct and square, and do not form bands on the neck. I can not see that it is more than a variety.

This is the "pilot snake" of the Allegheny mountaineers.

Coluber obsoletus obsoletus Say.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1509	1	Carlisle, Pennsylvania.....		Prof. S. F. Baird.....	Alcoholic type.
5502	1	Sprout River, Alabama.....			do.
1693	2	Brazos River, Texas.....			do.
5503	1	Fort Riley, Kansas.....			do.
1601	1	Western Missouri.....		Dr. P. R. Hoy.....	do.
7212	2	Independence, Missouri.....			do.
7211	1	Creek Boundary.....			do.
2438	1	Elmira, Illinois.....		E. R. Boardman.....	do.
2432	2	Southern Illinois.....		R. Kennicott.....	do.
8960	1	Kinston, North Carolina.....		J. W. Milner.....	do.
2438	1	Elmira, Illinois.....			do.
10389	2	Cheat River, Maryland.....	Oct. —, 1879	F. P. McClean.....	do.
10651	1	Wheatland, Indiana.....	Apr. —, 1881	Robert Ridgway.....	do.
10806	1	Potomac Boat Landing, Virginia.....		J. C. Van Hook.....	do.
10578	1	Wheatland, Indiana.....	May —, 1881	Robert Ridgway.....	do.
5070	1	Kansas.....			do.
5079	1	Wheelock, Texas.....			do.

Coluber obsoletus obsoletus Say—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1713	1	New Braunfels, Texas		Dr. F. Lindheimer	Alcoholic type.
1734	1	Indianola, Texas		Col. J. D. Graham, U. S. A.	do.
2260	1	Near 32° L.		Capt. John Pope, U. S. A.	do.
12031	1	Mount Carmel, Illinois	Nov. —, 1881	L. M. Turner	do.
12020	1	do	Nov. —, 1881	do.	do.
10652	1	Wheatland, Indiana	Apr. —, 1881	Robert Ridgway	do.
2421	2	Prairie Mer Rouge, Louisiana		Jas. Fairie	do.
13837	1	Olney, Illinois		J. and C. Walker	do.
14435	1	Wytheville, Virginia		M. McDonald	do.
14831		Georgiana, Florida		William Wittfield	
15334		Broad Creek, Maryland		Thomas Marron	
15674		San Diego, Texas		William Taylor	
17532		St. Louis, Missouri		Julius Hurter	
17561		Montgomery County, Maryland		Peter Leonhardt	
17948-9		Indianapolis, Indiana		O. P. Hay	
15575		Cherokee, North Carolina		James Mooney	
16490		St. Louis, Missouri		J. Hurter	

It is of an inoffensive disposition and may be handled with impunity.

The following observations concerning *C. obsoletus obsoletus* are made by Prof. O. P. Hay:¹

Of the Colubers I have been able to make observations on *C. o. obsoletus* alone. It is likely that others have observed and written on the subject, but I have not met with their statements. Dr. G. B. Goode reckons² this species among those which are ovoviviparous, but I am inclined to question this. My son, W. P. Hay, captured two of these snakes near Indianapolis while they were in sexual union. This was on June 19. The male (Cat. No. 17948, U.S.N.M.), was 5 feet 5 inches long, the female (Cat. No. 17949, U.S.N.M.), 6 feet 3 inches. When they were separated, the intromittent organs of the male were everted some 3 inches. A dissection shows that the hollow portion of the organ extends behind the vent 3 inches, while the retractor muscles form a cord which extends back nearly to the tip of the tail. On opening the female I find in her sixteen eggs. Of these eggs four lie about in the middle of the reptile's body, while the other twelve occupy a much more anterior position, the one farthest forward being within 8 inches of the snake's snout, the hindermost one only 9 inches farther back. Several of these eggs are lying apparently loose in the body cavity. It might be supposed that they had just left the ovary and were about to enter the oviduct; but they are surrounded each with a covering nearly as thick and tough as that of the *Heterodon*. Could these eggs have been in the oviducts and then squeezed out into the body cavity during the time of being entwined with the male?

I have had an opportunity of dissecting a recently captured female, the length of which was 4 feet 4 inches. The ovaries lie in the region situated about two-thirds the distance from the head to the vent. Each oviduct ends close to the corresponding ovary. It seems evident, therefore, that at least some of the eggs of the specimen described above are really lying loose in the body cavity. In the specimen dissected the ovarian eggs are very immature, none of them exceeding about a quarter of an inch in length. It may be of some interest to add that this female had the anterior three-fourths of the body ornamented with blotches of a decided red color, the red occupying both the surfaces of the scales and the skin between them. The blotches were separated by scales, which were partly yellow. Soon after death a great part of the red disappeared. The stomach contained eight wild mice, six of them young.

¹ Proc. Ind. Acad. Sci., 1891, p. 118; Proc. U. S. Nat. Mus., XV, 1892, p. 395.

² Proc. Am. Assoc. Adv. Sci., XXII, 1874, p. 185.

Dr. Stejneger adds the following note in the same publication:¹

I am able to state that *Coluber obsoletus obsoletus* is oviparous. Mr. Thomas Mar-ron, of the National Museum, early in April, 1889, collected a number of snake eggs in a hollow stump near the Potomac River. They were opened and found to contain fully developed young of this species. (Cat. No. 15334, U.S.N.M.)

Prof. O. P. Hay² gives the following further account of the habits of this species:

Coluber obsoletus spends its time in hiding about hollow logs and in holes about standing trees. It often ascends trees in search of birds and their young. Mr. A. W. Butler, of Brookville, Indiana, says they are the most destructive to birds of all our snakes. Besides birds, they no doubt prey on mice, rats, rabbits, and other small animals. The disposition of this serpent is gentle, and it makes little resistance when surprised and seized by head and tail. It will open its mouth in an attempt to bite, but struggles little. Under such circumstances a Racer would make a lively disturbance. One put into a box with a mouse would strike at the latter whenever it showed too much familiarity, but it was not harmed. In the stomach of one individual I found a number of young mice; in another were two old and six young mice.

This species probably reaches a greater size than any other snake that we have. Mr. Robert Ridgway tells me that he killed one at Mount Carmel, Illinois, which he estimated to be over 9 feet long. It made no resistance when attacked, and was as easily killed as an ordinary snake 2 or 3 feet long. This species has the habit, common to many snakes, of vibrating its tail so as to make a rattling or whirring sound. This probably serves to warn the larger animals of its presence so that they may avoid it.

Dr. G. B. Goode includes this snake among those which are said to "swallow" their young; that is, when danger threatens they open their mouths in order to allow the young to pass down the mother's throat for safety. More observations need to be made on this point.

I have been able to find in print no observations on the breeding habits of this snake. When and where are the eggs laid? How many of these are there? How soon do they hatch? These are a few of the things that many a farmer's boy might be able to find out for us. Two individuals were taken at Fall Creek, Marion County, while in sexual union. This was on June 19. The male was 5 feet 3 inches long; the female was 6 feet 3 inches. The female contained sixteen eggs. They have a thick covering and must be laid before hatching. Professor Blatchley writes³ that he kept one, 5 feet 7 inches long, for some time in confinement. It would on being disturbed vibrate its tail in such a way as to make a rattling sound. When the room was entered at night with a lamp the snake would hiss with a loud, gurgling noise. A large horned owl kept in the same room was attacked by the snake, tightly enveloped in its coils, and so badly crushed that it soon died.

Maximilian⁴ has confirmed the popular notion that the snake will eat fowls' eggs. One entered his room, climbed to a vessel of eggs, and swallowed a number of them. After the eggs had passed down the throat the shells were crushed by a powerful constriction of the walls of the stomach.

The relative sluggishness of this snake probably accounts for its rarity as compared with the black racer (*Z. constrictor*) in the more settled portions of the United States.

¹ Proc. Ind. Acad. Sci., 1891, p. 119; Proc. U. S. Nat. Mus., XV, 1892, p. 396.

² Batrachians and Reptiles of Indiana, Seventeenth Ann. Rept. State Geol. Indiana, 1892, p. 502.

³ Jour. Cin. Acad. Nat. Hist., 1891, p. 31.

⁴ Verzeichniss Rept., 1865, p. xxxii.

COLUBER OBSOLETUS LEMNISCATUS Cope.

Coluber obsoletus lemniscatus COPE, Proc. U. S. Nat. Mus., 1888, p. 386.

This subspecies agrees with the *C. obsoletus obsoletus* in the number of its urosteges and the number of rows of scales that are keeled. It presents in the typical specimen the probable anomaly of three temporals of the first row, like a specimen of the *C. o. obsoletus* from Texas. The characters which distinguish this one from the typical form are exclusively those of coloration.

The ground color above is a light brown. This is marked on the body by thirty-one nearly square or longitudinally oblong dark-brown spots, which are, like those of half-grown individuals of the *C. quadrivittatus*.

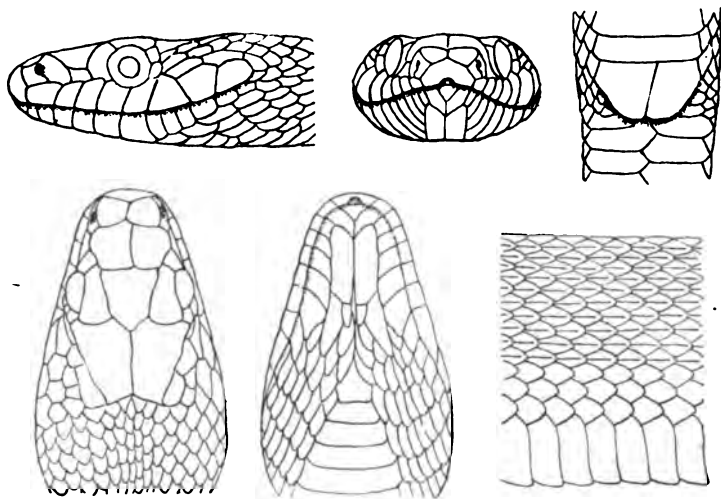


Fig. 195.

COLUBER OBSOLETUS LEMNISCATUS COPE

— 1.

Whitfield County, Georgia.

Cat. No. 4710, U.S.N.M.

connected at the angles by a longitudinal stripe on each side. The sides are marked by a wide, brown, longitudinal band which extends from the neck to the anus over a width of from four to six scales, including the first on each side. Belly yellow, tessellated with square, black spots, which become confused on the middle of the length, and finally blend in a nearly unbroken blackish brown, which extends to the end of the tail. Head brown, without markings, except a faint postocular band. Superior labials, with narrow, brown borders; inferior the same, but less distinct. Gular region uniform yellow.

Cat. No. 4710; gastrosteges, 246 + 1; urosteges, 75; scales, 27; total length, 936 mm.; tail, 218 mm.

These specimens and another one in my private collection from Mobile, Alabama, are distinctly four banded, as in the *C. quadrivittatus*; but

they differ from that species in coloration in the much greater width of the lateral band and in the dark coloration of the abdomen. Although the scale characters of the *C. o. lemniscatus* are those of the *C. obsoletus obsoletus*, it might be regarded as a distinct species from it were it not for the intermediate characters presented by two other individuals—one from Georgia (Cat. No. 8798, U.S.N.M.), and one from Mobile, Alabama. In these serpents the longitudinal bands are present, but the lateral shows distinct traces of the spots of the ordinary form, which are, indeed, separated from each other at the middle of the length, thus interrupting the band for a short distance. The postocular band is more distinct. Dorsal spots thirty.

Cat. No. 8798; gaстрosteges, 227 + 1; urosteges, 82; scales, 27.

Both specimens of this subspecies have the parietals truncated behind.

Coluber obsoletus lemniscatus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
4710	1	Whitfield County, Georgia.	.....	Alcoholic.
8798	1	Augusta, Georgia.....	William Phillips	do.

This form is intermediate between the *C. quadrivittatus* and the *C. obsoletus*. The lateral band is much wider than that of the former species. A specimen was sent me from Mobile, Alabama, by Dr. Joseph Corson, United States Army, and it is therefore probably found in Florida, though it has not yet been actually obtained there. A second specimen is in the U. S. National Museum from Whitfield County, in northern Georgia. Two other specimens—one from Mobile and one from Georgia—show the lateral bands interrupted into spots posteriorly, and hence connect with the *C. o. spiloides* Duméril and Bibron (*C. o. confinis* Baird and Girard, Cope, formerly).

COLUBER LÆTUS Baird and Girard.

Coluber lætus COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 636.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 49.

Scotophis lætus BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 77.

Although known to me from but one specimen, this species must be regarded as distinct, occupying a position between the *C. spiloides* and the *C. emoryi*.

The head is but little distinguished from the body, which is cylindric and not compressed. The muzzle is rather narrow, and the rostral plate is also rather narrow, and the frontal is a little longer than wide. The supraorbitals are abruptly narrowed in front, and the parietals are rather small, although longer than the muzzle from the frontal plate. The loreal is well developed, and the two postoculars are subequal. Temporals 3-4-5, the third row extending from the posterior side of

the last (eighth) superior labial. The sixth and seventh superior labials are of equal elevation, and a little higher than the eighth. Inferior labials 14. Postgenaeals much smaller than pregenaeals. Scales in 29 rows; the fifteen median rows keeled, most of them distinctly. First row a little larger than second.

The ground color is brown, and it is crossed on the back (in the typical specimen) by 29 spots anterior to the vent, which have rounded angles and are of a dark brown color, with darker borders, and these again with paler borders on the median dorsal region. These spots are wider than long except the three or four anterior ones. They alternate with large brown spots on the sides, which are elongate antero-posteriorly on the anterior part of the body. Each one corresponds to two smaller, very indistinct spots below it on the ends of

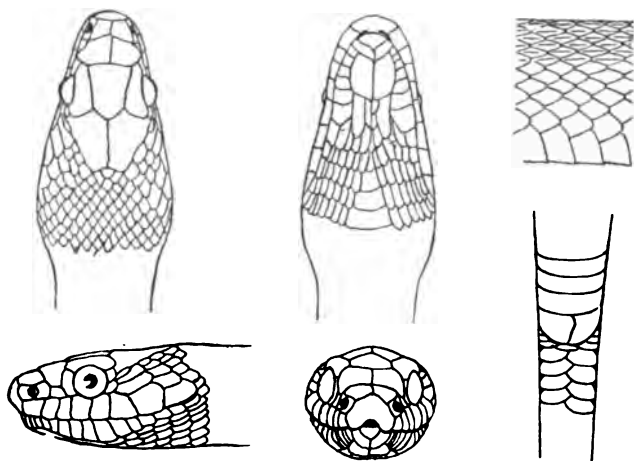


Fig. 196.

COLUBER LETUS BAIRD AND GIRARD.

= 1.

Fort Smith, Arkansas.

Cat. No. 2257, U.S.N.M.

the gastrosteges, which are, on the posterior two-thirds of the body, confluent into a dusky band. These bands continued on the inferior side of the tail. The abdomen is unspotted anteriorly, but near the middle has traces of spots on each side, which are soon lost in a general cloudiness, bounded by a light streak on each side, at the position of the angle of the gastrosteges.

On each side of the nape is a dusky band which extends forward across the external border of the parietal plate, over the entire supra-orbital plate, and crosses to meet that of the opposite side, involving the entire prefrontal plates except the anterior border. A similar band connects the lateral bands across the posterior part of the frontal plate. No postocular band nor labial borders, but the yellow of the superior labial plates is bounded above by the border of the dark color of the

temporal regions, which extend from the orbit to the inferior posterior angle of the seventh superior labial. Throat immaculate, yellowish.

Cat. No. 2257; gastrosteges, 244 + 1; nosteges, 77; scales, 29; total length, 708 mm.; tail, 143 mm.

This species resembles in general the *C. spiloides*, but there are important differences. Besides the increased number of the temporal scales the form of the head and body are different; the head being less distinct and the body not compressed, and there are more of the dorsal scales keeled. The dorsal spots show none of the produced angles of the *C. spiloides*. The continuation of the nuchal bands over the supraorbital shields to the prefrontals is peculiar to this species, since in all the other banded species the nuchal bands unite on the middle line of the frontal, or parietals, and the prefrontal band is in line with the postocular. Here there is no postocular.

Coluber latus Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.
2257	1	Fort Smith, Arkansas	Lieut. A. W. Whipple, U. S. A.

I have not been able to find the type of Baird and Girard, which may be lost. The specimen above described agrees with it in essential particulars except in the number of gastrosteges, which number in the type 227. The latter is from a locality not far from that of the present animal, viz, the Red River in Arkansas.

COLUBER EMORYI Baird and Girard.

Coluber emoryi COPE, Check-list N. Amer. Batr. Rept., 1875, p. 39.

Scotophis emoryi BAIRD and GIRARD, Cat. N. Amer. Rept., Serp., 1853, p. 157; Report U. S. Mex. Bound. Surv., II, Pt. 2, 1859, p. 19, pl. XII.

Scotophis calligaster KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1859, p. 99.

Coluber rhinomegas COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 255.

Coluber guttatus BOULENGER, part, Cat. Snakes Brit. Mus., 1894, p. 39.

Plates and shape of head much as in *C. guttatus*. Three well-developed scales in the first row of temporals. Frontal plate more elongated than in the species of allied color, being decidedly longer than broad. Head rather narrow. Eye larger than in *C. guttatus*, its center a little posterior to the junction of the fourth and fifth labials. Postorbitals resting on the fifth labial, as in the other species. Anteorbital large. Loreal elongated, acute angled behind. Upper labials eight, sixth and seventh largest; lower eleven, sixth largest. Dorsal rows of scales 27-29, all smooth, except traces on central five or six, in a very few individuals; exterior row largest; rest nearly equal. Ground color grayish ash. A series of olivaceous brown transverse quadrate blotches along the back as high as seventy in number, from thirty-five to fifty anterior

to the anus (in one specimen only thirty-three anterior to the anus). These are ten or twelve scales broad, two or three long, and separated by intervals of one or two scales. They are narrowly margined with black. On each side of the dorsal series, and alternating with it, is a series of smaller, nearly circular, but similarly constituted blotches extending between the third and seventh or eighth rows; below this and on the second and third rows is a still smaller and quite distinct third series, and occasionally traces of a fourth on the first and second. The ground color or space between the blotches is grayish ash; each scale minutely mottled with dark brown or black; the extreme border

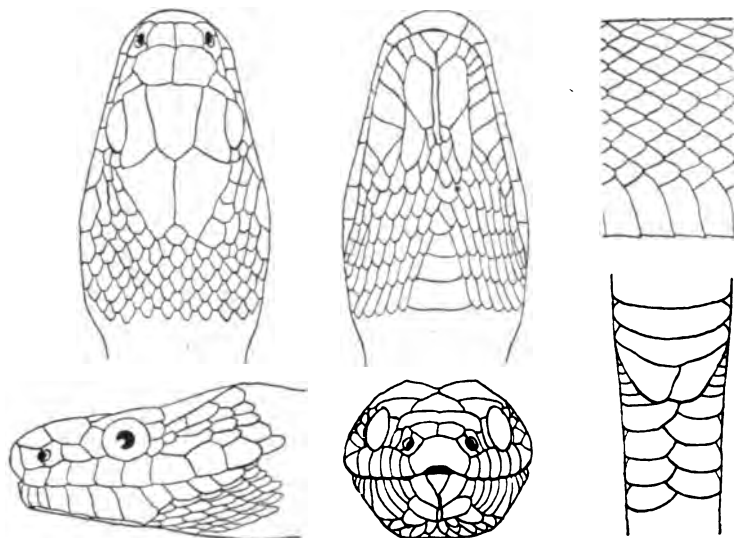


Fig. 197.

COLUBER EMORYI BAIRD AND GIRARD.

× 1.33.

Pecos River, Texas.

Cat. No. 1716, U.S.N.M.

generally pure ash, especially on the sides. Beneath yellowish white, with rather indistinct blotches of brownish ash, thickest behind.

Head grayish ash, with a somewhat curved broad brown vitta on the back part of the postfrontals, which, involving the commissure of the anteorbital and superciliary, passes back through the eye, and, crossing the angle of the mouth on the adjacent halves of the ultimate and penultimate labials, extends into the blotches on the sides of the neck. A second nearly effaced bar crosses the anterior frontals, leaving an ash-colored band half the width of the first-mentioned bar. The anterior dorsal blotch is replaced by two elongated ones running up on the head to the center of the occipitals, parallel with the postocular vitta, with an ash-colored stripe between the two, which extends from the superciliary backward on the sides of the neck. As in the other brown

marks, these stripes are margined with black. The adjacent edges of the fourth and fifth labials are brown. This is the only species, except *C. guttatus*, in which the postocular vitta crosses the angle of the mouth and passes down the side of the neck. There is scarcely any indication of elongation in the lateral spots except anteriorly.

This species differs from *C. vulpinus* in the gray color, much larger eye, longer head, narrower vertical, etc.; from *C. latus* in much the same points, as well as in having the dorsal spots transverse, not longitudinal; from *C. obsoletus* in lighter color and absence of white margins to the basal ends of the dorsal scales, and from all in the smooth dorsal scales.

Cat. Nos.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
1707	219 + 1.	72.	27.		
1716	222 + 1.	68.	29.	795.	162.
2263	217 + 1.	78.	29.		
4766	219 + 1.	65.			
4965	236 + 1.	63.	27.		
14223	222 + 1.	73.			
13333	236 + 1.	76.	29.		

This is a southwestern species of the Eastern region, not having been yet found east of the Mississippi River nor north of Kansas. Its range extends at least as far south on the Mexican Plateau as the city of Chihuahua, where it has been found abundantly by Mr. Edward Wilkinson.

Coluber emoryi Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
4766	1	Howard Spring, Texas.....	J. H. Clark	Alcoholic type
1707	1	Fort Riley, Kansas .....	.....	do.
1694	1	Arkansas .....	.....	do.
1712	1	Brazos River, Texas	Dr. B. F. Shumard	do.
4065	1	Fort McKavett, Texas.....	Dr. H. J. Anderson	do.
1716	1	Pecos River, Texas	Capt. John Pope, U. S. A.	do.
2263	1	do	Maj. W. H. Emory, U. S. A.	do.
5506	1	Santa Caterina, Mexico	Lieutenant Couch, U. S. A.	do.
2259	1	Fort Bliss, New Mexico.....	Dr. S. W. Crawford, U. S. A.	do.
14223	1	Kansas	R. Kennicott	do.
17073	1	City of Chihuahua, Mexico.....	E. Wilkinson	do.
22138	1	Cameron County, Texas	C. K. Worthen	do.
15501	1	Las Cruces, New Mexico.....	J. M. Walker	
15673	1	Lower Rio Grande (!) .....	.....	
		San Diego, Texas	William Taylor	

COLUBER BAIRDII Yarrow.

Coluber bairdii YARROW, Bull. U. S. Nat. Mus., No. 17, 1880, p. 41.—COPE, Proc. U. S. Nat. Mus., XIV, 1891, p. 631.

Coluber guttatus BOULENGER, part, Cat. Snakes Brit. Mus., II, 1894, p. 40.

Body rather compressed. Head very broad; neck contracted. Frontal plate longer than broad; parietals moderate, longer than muzzle anterior to frontal. Two temporals of the first row; superciliaries broadest posteriorly; anterior orbital one; postorbitals two, lower largest; nine upper labials, seventh largest; lower border of orbit formed by upper

margins of the fourth and fifth upper labials; lower labials twelve, seventh largest. Postgenaeals narrow, separated by three scales, divided transversely so as to differ little from gular scuta. Dorsal rows of scales twenty-seven, long and lozenge-shaped; five median dorsal rows slightly carinated. General color above (alcoholic) warm grayish-ash, beneath yellowish; behind occipitals two converging oblong brown blotches, and posterior to these a series of narrow transverse brown blotches, eighty in number, becoming obsolete near caudal extremity; these blotches are six scales in width. Laterally, below, there is a corresponding series of irregular blotches on both sides, almost obsolete. Along upper border of abdominal scutellæ, on both sides, are strongly marked small black blotches at intervals of two, sometimes three scales. Anterior portion of abdominal scutellæ black, maculated; on head a black band begins at anterior margin of superciliary and extends nearly across and to nearly the entire width of the postfrontal; upper labial margined with blackish-brown posteriorly, lower labials also; a blotched line of blackish-brown extends from posterior lower angle of orbit to angle of mouth; under surface of jaw yellowish white.

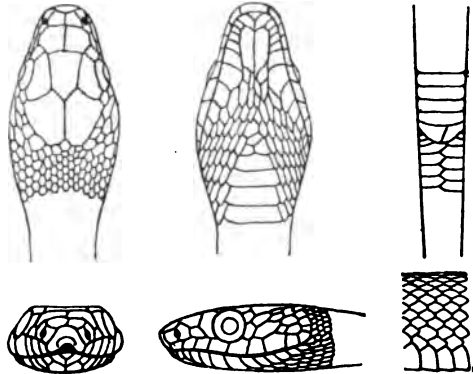


Fig. 198.

COLUBER BAIRDII YARROW.

× 1.3.

Fort Davis, Texas.

Cat. No. 10403, U. S. N. M.

Cat. No. 10403; urosteges, 99; scales, 27; total length, 382 mm.; tail, 91 mm.

The nine superior labials and divided postgenaeals distinguish this species readily from all other North American forms. The coloration is also entirely peculiar.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
10403	1	Fort Davis, Texas	— —, 1878	Hospital Steward, W. F. von Manteuffel, U. S. A.	Alcoholic type.

COLUBER MUTABILIS Cope.

Coluber mutabilis COPE, Proc. Am. Phil. Soc., 1884, p. 175.

Coluber triaspis COPE, Proc. Am. Phil. Soc., 1879, p. 271; not of COPE, Proc. Acad. Nat. Sci. Phila., 1886, p. 128.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 37.

Natrix mutabilis COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 71.

Scales in 31–3 rows; one loreal; eight upper labials; three rows of temporal scuta; dorsal and lateral spots smaller and separated; three

longitudinal bands behind frontal region; all the markings becoming obsolete in a general brown color with maturity.

The head is rather long and narrow. The prefrontals are each longer than wide; the frontal is not narrowed; the parietals are truncate behind. The suture between the loreal and prefrontal is oblique, running posteriorly downward, so that its superior border is only half as long as the inferior. The preocular does not reach the frontal. There are, as in other Mexican species of the genus, but two postoculars. The eye is over the fourth and fifth labial. None of the labials behind the fifth is elevated, but the sixth is elongate so as to border the ends of the three long temporal scuta. The inferior of these covers the seventh and part of the eighth labials and supports above it two others like it, all being directed downward and forward. The superior incloses a little scale with the superior postocular. Inferior labials, eleven; génieals well developed, the posterior smaller and separated by scales.

In a young specimen 450 mm. in length, where the color markings have not become obsolete, there are seventy-six dorsal spots, of which fifty-one are between the nape and the vent. These spots are transversely quadrate, covering eleven scales transversely and two and a half scales anteroposteriorly. They are dark brown with light edges and paler centers. The interspaces are less than two scales long. The lateral spots are opposite the intervals and are in one row; they are subround or suboval. There are two brown stripes on the nape which, instead of uniting at both ends, as is the case in the *C. flavirufus*, are separate posteriorly and diverge anteriorly, extending to above the posterior part of the orbits. Between them another band occupies the middle line, but is more or less broken. A broad brown band convex forward between the fronts of the orbits. A brown spot behind orbit. Below, immaculate. Gastrosteges, two hundred and eighty-two; anal double; urosteges, one hundred and nine.

Measurements.—Total length, 1.090 mm.; tail, 235 mm.

Slight variations sometimes occur in the *C. mutabilis*. One specimen has thirty-five rows of scales; another has but two rows of temporals on one side; another has nine superior labials on one side.

Of the *Coluber mutabilis* I have before me four specimens from Vera Paz, from Mr. Hague; one from the plateau of Costa Rica, from Mr. Zeledon, and one from the central or elevated part of the State of Oaxaca, from Mr. Sumichrast. I have examined a seventh specimen in the collection of Prof. Alfredo Dugès, who took it in the State of Guanajuato. Dr. Dugès informs me that it has been also found near Leon, so that there is no doubt that it belongs to the plateau of Mexico as well as to that of Guatemala. According to the same author it occurs also in San Luis Potosi and in Guerrero.

Dr. Boulenger, in the Catalogue of Snakes in the British Museum, has confused this species with the *C. triaspis* Cope. The differences between the species are enumerated in the analytical table on page 828.

The *C. triaspis* is a very different snake, having somewhat the appearance of a *Trimorphodon* in the form and color pattern of its head. Like the third Mexican species of *Coluber*, the *C. flavirufus* Cope, it is an inhabitant of the Tierra Caliente.

Coluber mutabilis Cope.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
4	Vera Paz.....	Henry Hague.....	Alcoholic.
1	Oaxaca.....	F. Sumichrast.....	do.
1	Costa Rica.....	F. Zeledon.....	do.

COMPSOSOMA Duméril and Bibron.

Compsosoma DUMÉRIL and BIBRON, *Exp. Gén.*, VII, 1854, p. 290.—COPE, *Trans. Amer. Phil. Soc.*, 1895, p. 204.

Spilotes WAGLER, part, *Naturl. Syst. d. Amphibien*, 1830, p. 179.—DUMÉRIL and BIBRON, *Exp. Gén.*, VII, 1854, p. 248.—GÜNTHER, *Cat. Col. Snakes Brit. Mus.*, 1858, p. 96.—COPE, *Bull. U. S. Nat. Mus.*, No. 32, 1887, p. 56.

Georgia BAIRD and GIRARD, *Cat. N. Amer. Rept.*, Pt. 1, *Serp.*, 1853, p. 92.

Phrynonax COPE, *Proc. Acad. Nat. Sci. Phila.*, 1862, p. 348.—BOULENGER, *Cat. Snakes Brit. Mus.*, II, 1894, p. 18.

Teeth of equal lengths. Head plates normal; two nasals, one loreal and one preocular. Scales in an odd number of rows, bifossate. Anal plate entire; subcaudal scuta divided. Pupil round.

This genus embraces the largest ground snakes of the Neotropical realm, together with a number of species of smaller size of the Palearctic. It differs from *Coluber* in its entire anal plate, resembling in this respect *Pityophis*, *Epiglottophis*, and *Rhinechia*. It approaches the last named most nearly in characters, but the rostral shield has not the production anteriorly and posteriorly seen in that genus.

The Asiatic species have a compressed form of the body which is not seen in the American forms. Some of the latter have a roof-shaped body with subtriangular section (*C. sulphureum*), while in others (*S. corais*) the body is subcylindric. The scales assume a slightly transverse direction in some of the American species. But one species is found in the United States, and this is a Neotropical species which ranges from Brazil through Mexico and the Gulf States to the Atlantic coast.

It may be found necessary to separate the American species from this genus, as has been done by Boulenger, under the name of *Phrynonax* Cope. I do not at present, however, know of any character which requires this. The difference of dentition pointed out by Dr. Boulenger is insignificant, as his definition indicates. The integrity of the anal plate is a definite character that can always be observed, which is more than can be said for the slight differences of dentition referred to. The character of the anal plate is not quite constant in one of the Asiatic species (*C. virgatum*), according to Boulenger.

COMPSOSOMA CORAIS Boie.

Coluber corais BOIE, Isis von Oken, 1827, p. 537.—SCHLEGEL, Ess. Phys. Serpens, I, 1842, p. 145; II, p. 139, pl. v, figs. 9, 10.

Phrynonax corais BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 31.

Spilotes corais DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 223.—GÜNTHER, Cat. Brit. Mus., 1858, p. 98.—COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 72.

Head moderately distinct, oval. Body elongate, subcylindric; tail one-sixth to nearly one-eighth the total length. Rostral plate moderately prominent, broader than high, visible from above, but not dividing the internasals. Internasals much smaller than prefrontals. Frontal as broad as long; superciliaries posteriorly wider than frontal. Parietals large, longer than wide. Postnasal higher than prenasal; loreal rather small, longer than high. Oculars 1-2, the anterior widely separated above from frontal. Temporals 2-2, all long and narrow, those of the second row coinciding in anteroposterior extent with the last superior labial. Superior labials eight, the fourth and fifth bounding the orbit; the sixth triangular, the apex not reaching the postocular. Seventh higher but not longer than the eighth. Inferior labials eight, fifth largest. Geniials short, anterior pair the longer.

Scales smooth, rather wide, in seventeen rows.

Color varying from light brown to black, the tints when not uniform covering large parts of the body.

Size large, reaching a length of 8 feet, with robust proportions.

There are three color varieties of this species which pass into each other, but which have especial geographic ranges. They are as follows:

Color light brown, with a black oblique stripe on each side of the neck... *C. c. corais*.
Color like *C. c. corais* anteriorly, but more or less of the posterior part of the body with tail, black..... *C. c. melanurus*.
Color black, the anterior gastrosteges with dark red bases, and the superior labials generally with dark red borders..... *C. c. couperii*.

The *C. c. corais* inhabits South America; the *C. c. melanurus* Central America and Mexico, and the *C. c. couperii* the Gulf States of North America

COMPSOSOMA CORAIS COUPERII Holbrook.

Spilotes corais couperii COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 637.

Coluber couperii HOLBROOK, N. Amer. Herpt., III, 1842, p. 75, pl. xvi.

Georgia couperii BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 92.

Spilotes couperii COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 564; Check-list N. Amer. Batr. Rept., 1875, p. 39.

Georgia obsoleta BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 158 (not *Coluber obsoletus* SAY).

Spilotes erebennus COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 564; Check-list N. Amer. Batr. Rept., 1875, p. 39.

General color above black; some of the scales having dashes of reddish white at their bases, scarcely indicating blotches; the same color is sometimes shown on the skin. Beneath slate-black. The color is

uniform on the posterior half; the bases of the scuta then begin to exhibit more or less of reddish, which tint increases in extent and inten-

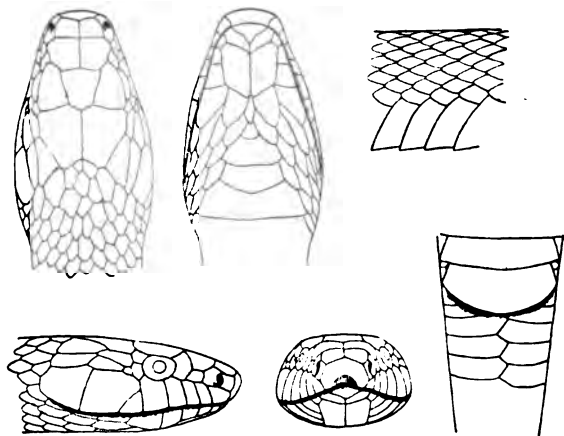


Fig. 199.

COMPSOBOMA CORAIS COUPERII HOLBROOK

= 1.

Brunswick, Georgia.

Cat. No. 4504, U.S.N.M.

sity anteriorly until toward the head the slate-color is only seen along their edges, the tint there being a dark salmon-color. The posterior margins of the upper and lower labials, as well as all the plates on the

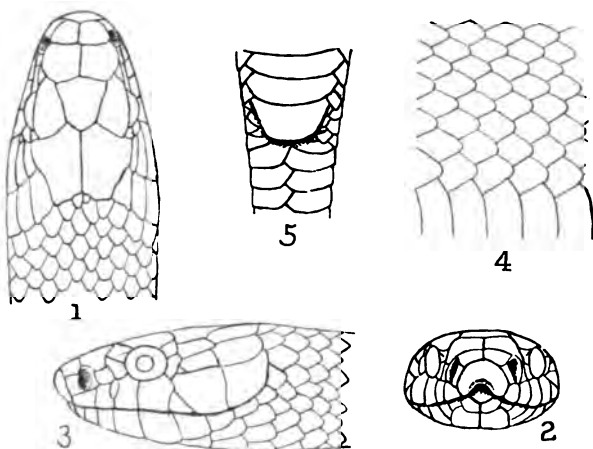


Fig. 200.

COMPSOBOMA CORAIS COUPERII HOLBROOK.

= 1.

Cat. No. 4457, U.S.N.M.

sides of the neck and beneath, are edged with well-defined black. Sides of the head reddish brown, margined as above.

Specimens from the Lower Rio Grande have a good deal of brown on the bases, edges, or tips of the scales, thus approaching the form *melanurus*. On the other hand, specimens from the sea islands of Georgia are everywhere pure black, except some brownish-red shades on the throat and chin. Specimens from this locality have in some instances but seven superior labials, and I do not know of any which has eight on both sides. Two specimens (Cat. Nos. 4457, 4458) have seven on one side and eight on the other. The species *Spilotes couperii* was proposed by Dr. Holbrook for this form, but I find no characteristic to separate it from the individuals from the other Gulf States and Texas, except the number of labials, and this is, as observed, variable.

Baird and Girard give the following scutal formula and dimensions, the latter in inches:

Locality.	Gastrosteges.	Urosteges.	Length.	Tail.
Altamaha, Georgia	184 + 1.	60.	60.	11
Eagle Pass, Texas	193 + 1.	60.	45½.	7½
Do	193 + 1.	60.	48½.	9½

The largest specimen in the U. S. National Museum is from Gainesville, Florida. Its length is 1,117 mm., of which the tail is 270 mm.

Spilotes corais couperii Holbrook.

Catalogue No.	Number of specimens.	Locality.	When collected.	Whence obtained.	Nature of specimen.
455	1	Liberty County, Georgia.	.....	Dr. W. L. Jones	Alcoholic.
458	1	do	.....	do	do.
1862	1	Eagle Pass, Texas.	.....	A. Schott.	do.
1860	1	Brownsville, Texas.	.....	Capt. S. Van Vliet, U. S. A.	do.
1849	1	Matamoras, Mexico.	.....	Capt. John Pope, U. S. A.	do.
4504	1	Brunswick, Georgia.	.....	D. C. Dowine	do.
1843	1	Lower Rio Grande.	.....	A. Schott.	do.
1859	1	Matamoras, Mexico.	.....	Lieutenant Couch, U. S. A.	do.
10824	1	Gainesville, Florida.	.....	.....	.....
10490	1	do	July —, 1880	James Bell.	do.
10465	1	do	May —, 1880	do.	do.
10761	1	Florida	.....	do.	do.
10545	1	Milton, Florida	May —, 1881	S. T. Walker	do.
10379	1	Clearwater, Florida	— —, 1879	do.	do.
14842	.....	Gainesville, Florida	.....	James Bell.	.....
15675	.....	San Diego, Texas	.....	Wm. Taylor.	.....

EPIGLOTTOPHIS Cope.

Epiglottophis COPE, Trans. Amer. Phil. Soc., XVIII, 1895, p. 204.

Hemipenis colubriform, with numerous calyces. Teeth equal. Scales in an unequal number of rows with paired pits; anal plate entire, subcaudals divided. Two prefrontal and two internasal plates. A compressed prominent epiglottis. Pupil round.

This genus is *Pityophis* with only two prefrontal plates. It includes with present information, two species of the Medicolumbian region, which differ as follows:

Head shorter; supraocular plates wide; a median series of large quadrate dorsal spots..... *E. pleurostictus* Duméril and Bibron.
 Head longer; supraorbital plates narrow; longitudinal black stripes, broken posteriorly and becoming transverse ∞ -shaped spots..... *E. lineaticollis* Cope.

EPIGLOTTOPHIS PLEUROSCTICTUS Duméril and Bibron.

[No description of this species was found in Professor Cope's manuscript. Description and synonymy are given in Boulenger's Catalogue of the Snakes in the British Museum, II, 1894, p. 66, under the name *Coluber deppii*.]

EPIGLOTTOPHIS LINEATICOLLIS Cope.

Arizona lineaticollis COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 300.

Spilotis lineaticollis COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 72.

Pityophis lineaticollis GÜNTHER, Biol. Centr.-Amer. Rept., 1894, p. 124, pl. XLVII.

Coluber lineaticollis BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 64.

Head distinct, elongate. Rostral plate rounded in profile, much elevated; posterior angle right, not reaching postfrontals. The latter, three times the size of the prefrontals. Vertical longer than broad, the anterior border straight, as long as the occipitals. Five or six small temporals on each side. Nasal plates large; loreal longer than high. Preoculars one or two, postoculars three. Superior labials eight or nine, liable to irregular subdivision; fourth and fifth or fourth, fifth, and sixth entering the orbit. Twelve inferior labials; postgeni-als very small. Scales small in twenty-seven rows, the median ten keeled. Tail very short. Gastrosteges, 234-244; urosteges, 69-72. General color of a specimen long preserved in spirits, above light brown; beneath paler. The head is without markings. On the anterior part of the body, two black bands, two and two halves rows of scales apart, extend for four times the length of the head and terminate each in a narrow elliptic annulus. The latter are nearly confluent with the succeeding pair of annuli, which are very narrow. These increase in breadth posteriorly until near the middle of the body they become confluent on the median line, forming geminate open spots; near the tail they lose the geminate form. Their whole number is thirty-six pairs, separate or united. Alternating with these is a smaller series of annuli, which become elongate anteriorly, and finally become short black lines, parallel to, and three scales from the median pair. A few spots on the extremities of the gastrosteges or the posterior part of the abdomen.

Measurements.—Total length, 1,320 mm.; length of tail, 190 mm.

Epiglottophis lineaticollis Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
9140	2	Southern plateau	Dr. C. Sartorius	Alcoholic.

This species was originally described from a specimen in the museum of the Philadelphia Academy from Jalapa. It therefore inhabits both the Austroriental and Austroccidental districts. The *E. pleurostictus*

is found in the Austrocentral and Austroccidental districts, as well as in the Chihuahuan of the Sonoran subregion. The *E. lineaticollis* is also reported by Günther from Durnäs, in Guatemala.

Though this species differs widely in color characters from the *E. pleurostictus* it resembles it closely structurally. Boulenger places the two in different sections of the genus *Coluber*, one of which is characterized by a more, and the other by a less, distinct vertical angulation of the ends of the gastrosteges. I, however, find no difference between the two species in this respect. The following characters may, however, be noted: The head in the *E. lineaticollis* is larger relatively to the general dimensions than in the *E. pleurostictus*. Thus the cephalic plates are of equal length in two specimens of these species, of which the *E. lineaticollis* measures 950 mm. and the *E. pleurostictus*, 1,145 mm. The gastrosteges and urosteges are more numerous in the *E. lineaticollis*. In this species there are in two specimens, gastrosteges 242, urosteges 72, and gastrosteges 234, urosteges 69. Boulenger counts 244 + 69. In two specimens of *E. pleurostictus* I find, gastrosteges 228, urosteges 58, and gastrosteges 221, urosteges 54. Boulenger gives gastrosteges 209–233, urosteges 51–67. My three specimens of *E. lineaticollis*, like Günther's, have twenty-seven rows of scales, and the three of *E. pleurostictus* before me have twenty-nine. Of seven specimens of the latter in the British Museum three have twenty-nine rows and four twenty-seven, according to Boulenger. Finally, the relations of the frontal and supraocular plates differ in the two. In the *E. lineaticollis* the supraoculars are narrow and the frontal wide; in the *E. pleurostictus* the supraoculars are relatively wider. The shorter head of the latter species is shown in the loreal, which is as deep as long, while in the *E. lineaticollis* it is a little longer than deep.

Measurements.—The longest specimen of this species in the U. S. National Museum measures 1,320 mm.; tail, 190 mm. The British Museum specimen measures 1,500 mm. The longest *E. pleurostictus* (Cat. No. 9065) in the U. S. National Museum measures 1,145 mm.; tail, 165 mm. The British Museum catalogue gives 1,690 mm. as the greatest length.

RHINECHIS Michahelles.

Rhinechis MICHAHELLES, in Wagler, *Icones et Descript. Amphib.*, 1833, pl. 25.—

BONAPARTE, *Fauna Italica*, 1838, pl. 70.—DUMÉRIL and BIBRON, *Erp. Gén.*,

VII, 1854, p. 227—COPE, *Bull. U. S. Nat. Mus.*, No. 32, 1887, p. 56.

Arizona KENNICOTT, *U. S. and Mex. Bound. Surv.*, II, 1859, *Reptiles*, p. 18.

Head moderately distinct, muzzle depressed, projecting. Tail rather short. Teeth equal. Cephalic plates normal; the rostral recurved and deeply separating the elongate internasals. Pupil round. Scales smooth, bifossate. Anal and subcaudal scuta entire.

The production and recurvature of the rostral plate and entire anal plate distinguish this genus from *Coluber*, which it resembles. It was

at one time thought to be allied to *Pityophis* in view of the presence of the two characters in question, but the absence of the epiglottis and undivided prefrontals show that it is distinct. There are several minor characters, not generic, which show that its affinities are not with the species of *Pityophis*. Such are the peculiar forms of the inferior labial, prenasal, and loreal plates, and the very fine bristle-like spicules of the hemipenis, in the American species at least.

Two species are known, which differ as follows:

Scales in from 27 to 31 rows. Tail less than one-sixth the length. Brownish gray, with numerous transverse brown dorsal spots, with alternating lateral spots.

R. elegans.

Scales 25-29. Tail more than one-sixth the length. Adult with a pair of brown stripes *R. scalaris*.

RHINECHIS ELEGANS Kennicott.

Rhinechis elegans COPE, Proc. Amer. Phil. Soc., 1885, p. 284.

Arizona elegans KENNICOTT, U. S. Mex. Bound. Surv., II, 1859, Reptiles, p. 18, pl. 13.

Pityophis elegans COPE, Check-list N. Amer. Rept., 1875, p. 39.

Form of moderate robustness; head moderately distinct; tail short, between one-sixth and one-seventh the total length. Scales in from

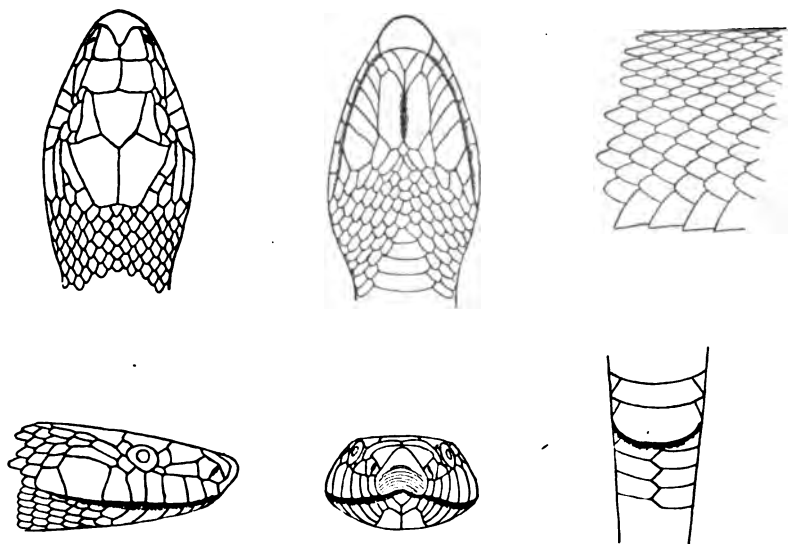


Fig 201.

RHINECHIS ELEGANS KENNICOTT.

= 1.

Between the Arkansas and Cimarron Rivers.

Cat. No. 4976, U.S.N.M.

twenty nine to thirty-one rows, usually twenty-nine rows; inferior rows not wide, median rows narrower, but not very narrow. Rostral plate prominent, viewed in profile, but not projecting when viewed from above, its posterior angle separating the internasals for half their length. The latter are longer than wide, and are decurved to front so

as to depress the form of the prenasal, a peculiarity I have not observed in any other North American snake. Prefrontals not so long as their posterior width. Frontal very wide in front, the lateral borders contracting posteriorly so as to greatly diminish the posterior lateral angles and to give the plate a subtriangular outline in adults. It follows that the superciliaries are triangular, with an oblique posterior outline. Parietals a little longer than wide, subtruncate posteriorly. Nostril in a fissure, which extends obliquely downward and backward, rendering each of the nasal plates subtriangular. Loreal considerably longer than high, with the superior border oblique downward and posteriorly. Oculars 1-2, temporals 2-4, the anterior elongate, and bounding the summit of the large seventh superior labial. Superior labials eight, fourth and fifth entering orbit; higher than long from the third to the sixth, inclusive. Seventh larger than usual, exceeding the sixth and eighth together, longer above than on the labial border. This size explains the absence of the usual second row of three temporals. The inferior labials are peculiar for their large number and unusual form. They number from thirteen to fourteen, and are all, therefore, deeper than long. This is especially the case with those from the third to the sixth, inclusive, which are produced in long points backward to the geneial plates. The seventh is the longest plate, but is separated by a scale from the geneial. Pregeneials of moderate length; postgeneials much shorter and narrower, and separated by 2-4 rows of scales. Behind these there are three transverse rows of small scales, anterior to the first gastrosteges.

Cat. Nos.	Gastrosteges.	Urosteges.	Length.	Tail.
			mm.	mm.
1722	217 + 1.	57.	917.	145.
4266	218 + 1.	1.	876. ¹	
14176	213 + 1.	42.	710.	90.

The ground color above is a grayish brown, growing paler at the median line. This is crossed by from fifty-five to sixty-five transverse brown spots anterior to the anus, which have the anterior and posterior borders a little darker than their central portions. These extend over twelve or thirteen rows of scales and are separated by spaces of one and a half or two scales in width. On the side is a series of spots, each of which is opposite a space, and is deeper than long. The scales of this region have their centers brown shaded, so as to obscure the distinctness of the lateral spots in some specimens. Belly yellowish-white, unspotted. On the nape two wide longitudinal stripes extend from the anterior transverse spot to the parietal plates. A blackish streak from eye to angle of mouth. Labials unspotted in adults, but with a spot under the eye in the young.

This species is subject to some variations. Thus in Cat. No. 4266 there is a small inferior preocular. In Cat. No. 14676 there are only

¹ To anus.

twenty-seven rows of scales, and there is a row of three temporals between the usual 2-4 scaled rows.

This species is restricted in its range to the Sonoran region. The most southern locality yet known is near the city of Chihuahua. The most northern is north of the Cimarron River, probably in New Mexico.

Mr. Bocourt objects to my placing this species in the genus *Rhinechis*, as he says that the *R. scalaris* has the anal plate divided. It is true that Duméril and Bibron state that this is the case, but on examining four specimens from the Bonaparte collection in the Museum of the Philadelphia Academy of Natural Sciences, I find that the anal plate is entire.

Rhinechis elegans Kennicott.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1722	1	Lower Rio Grande.....	.....	A. Schott.....	Alcoholic.
4266	1	Between Arkansas and Cimarron, New Mexico.	.....	J. H. Clark.....	do.
8408	1	Southeastern Arizona....	Oct. —, 1873	H. W. Henshaw.....	do.
8002	1	Camp Grant, Arizona.....	.....	E. Palmer.....	do.
1706	1	Pecos and Rio Grande, Texas.	.....	.....	.....
14176	1	Mojave Desert, California.	.....	Gustav Eisen.....	do.
16848	.....	Pacific Beach, San Diego County, California.	.....	C. R. Orcutt.....	.....
22036	.....	Coast Range, West Slope San Diego Wagon Road, California.	.....	Dr. E. A. Mearns.....	.....
22371	.....	Mesilla Valley, New Mexico.	.....	T. D. A. Cockerell.....	•

PITYOPHIS Holbrook.

Pityophis HOLBROOK, North American Herpetology, IV, 1842, p. 7.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 64.—DUMÉRIL, Prodrome des Ophidiens, 1853.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 252.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 85.—COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 56.

Churchillia BAIRD and GIRARD, Reptiles in Stansbury's Expl. Gt. Salt Lake, 1852, p. 350.

Teeth of equal length. A vertical laminiform epiglottis. Cephalic scuta normal, except that each prefrontal is longitudinally divided into two, producing four prefrontals. Rostral plate more or less prominent and its superior angle produced backward. Scales more or less keeled and with double apical pits. Anal scuta entire; subcaudals in two series. Pupil round.

This genus of Colubrine snakes includes rather large and robust species. They are restricted exclusively to the Nearctic realm and the Lower Californian district of the Neotropical. They are entirely terrestrial in their habits, preferring dry and even sandy regions to any other. They are of a harmless disposition as a general rule, but the *P. sayi bellona* defends itself vigorously when attacked. The peculiar epiglottis, first observed and described by Dr. C. A. White, of Washington, aids these snakes in emitting an unusually loud hiss on the

expiration of the air contained in their voluminous lung. This sound, although it can not be called a voice, is sufficiently loud to be alarming, and serves, no doubt, as a defense.

The question as to the number of species included in this genus is a difficult one to decide. The *P. melanoleucus* may be always distinguished by color characters from the forms found west of the Mississippi River. From some of these it also differs in the shape of the head and muzzle, but the most eastern of the western forms, *P. sayi sayi*, resembles it in these respects. The Lower Californian form may be distinguished from the *P. melanoleucus* by color characters and by the shape of the head and muzzle, but between it and the *P. sayi* of the western Mississippi region there is a complete transition in most of the characters. The California form resembles that of Lower California in form,

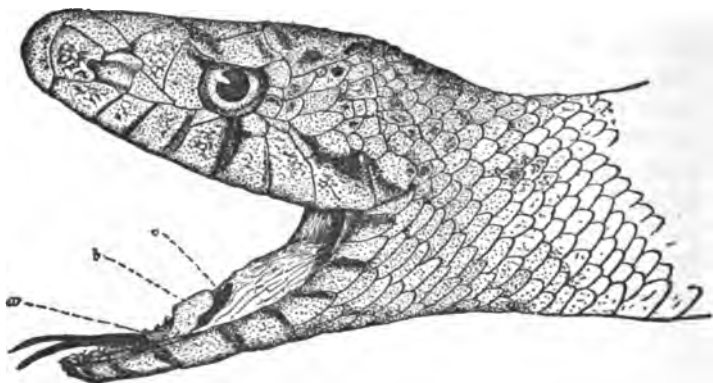


Fig. 202.

PITYOPHIS SAYI BELLONA BAIRD AND GIRARD.

= 1.

a, sheath of tongue; b, epiglottis; c, glottis.

From Dr. R. W. Shufeldt.

but differs in color, while the Arizona form is in every respect intermediate between the Pacific form (*P. catenifer*) and the *P. sayi* of the plains. These forms are tolerably constant and can be generally recognized. The form of the rostral plate is the most characteristic peculiarity, but from the nature of the case transitions occur. Under the circumstances, I have adopted four species, of which the *P. sayi* has two subspecies, one of which, *P. s. bellona*, is intermediate between its typical form and the *P. catenifer*, the latter differing, however, in the greater smoothness of the scales.

SYNOPSIS OF SPECIES.

Scales with stronger keels beginning on the fourth row; head short, elevated; rostral plate compressed and narrowed above; no head stripes; dorsal spots few, 27-33 on body.....*P. melanoleucus*.
Scales first keeled on the sixth row; rostral plate narrowed above; head stripes present; spots numerous, 40-65 on body.....*P. sayi*.

Scales weakly keeled, first on tenth row; rostral little prominent, not narrowed above; head flat; head stripes present; spots numerous, 36-79 on body. *P. catenifer*
 Scales weakly keeled, beginning on tenth row; rostral plate not narrowed, and little prominent; head flat; spots few, 40-44 on body; anteriorly red; no head stripes.....*P. vertebralis*.

The head stripes consist of a band extending from the eye to the angle of the mouth; another from the eye to the upper lip below it, and another connecting the orbits across the front of the frontal plate. These stripes are present in the young of the species, which lack them at maturity. The increase in the number of spots is accomplished by the division of those on the posterior part of the body.

The number of the labial plates is apt to be unequal on the opposite side. Thus in seventy-two specimens examined, fifteen have nine labials on one side and eight on the other. The *P. catenifer* displays the greatest irregularity in this respect, six out of sixteen specimens having labials 8-9.

PITYOPHIS MELANOLEUCUS Daudin.

Pityophis melanoleucus HOLBROOK, N. Amer. Herpt., IV, 1842, p. 7, pl. 1.—BAIRD and GIRARD, N. Amer. Rept., Pt. 1, Serp., 1853, p. 65.—DUMÉRIEUX and BIBRON, Erp. Gén., 1854, VII, p. 233.—GÜNTHER, Cat. Col. Serp. Brit. Mus., 1858, p. 86.—COPE, Check-list N. Amer. Batr. Rept., p. 39; Bull. U. S. Nat. Mus., No. 1, 1875, p. 39.

Coluber melanoleucus DAUDIN, Hist. Rept., VI, 1803, p. 409 (from Bartram).—HARLAN, Journ. Acad. Nat. Sci. Phila., 1827, p. 359.

Coluber melanoleucus DAUDIN, Hist. Nat. Rept., VI, 1799, p. 409.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 359; Med. and Phys. Res., 1835, p. 122.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 68.

Head ovoid, broad behind. Anteorbital one; postorbitals three. Dorsal rows of scales twenty-seven to thirty-one, the four outer rows smooth, fifth, sixth, and seventh with an obsolete keel. Tail about one-seventh of total length. Head spotted with black. Color of the body whitish, with a dorsal series of very large blotches, the twenty-fourth to thirtieth opposite the anus; anteriorly and posteriorly emarginated on the anterior third of the body; oblong posteriorly. Elongated smaller blotches on the flanks, forming three indistinct series, often confluent. Abdomen unicolor. A series of twenty-seven to thirty distinct blotches along the extremities of the scutellæ.

Head robust, conical. Frontal plate subpentagonal, broad anteriorly. Parietals a little larger than the frontal, and as broad anteriorly as long. Internal postfrontals elongated and subtriangular; external postfrontals polygonal. Prefrontals quadrilateral, separated by the rostral. Rostral narrow, very convex, raised above the surface of the snout, and reaching the prefrontals. Nasals very large, anterior one the larger. Nostrils vertically oblong, situated in the middle and between both plates. Loreal ovoid, small, horizontal. One large anteorbital, with its anterior margin convex, of the same width above as below. Three postorbitals, proportionally large. Temporal shields small, three or

four in the first row. Upper labials eight, seventh largest, fourth coming into the orbit. Lower labials fourteen, fifth and sixth largest, the five posterior ones quite small. Posterior pair of mental shields one-third of the size of the anterior pair, and reaching backward to opposite the middle of the lower sixth labial. Tail conical and tapering, forming about the seventh of the total length.

The ground color, when living, is white; as preserved in alcohol it is light yellowish brown. The head is spotted in the young with black

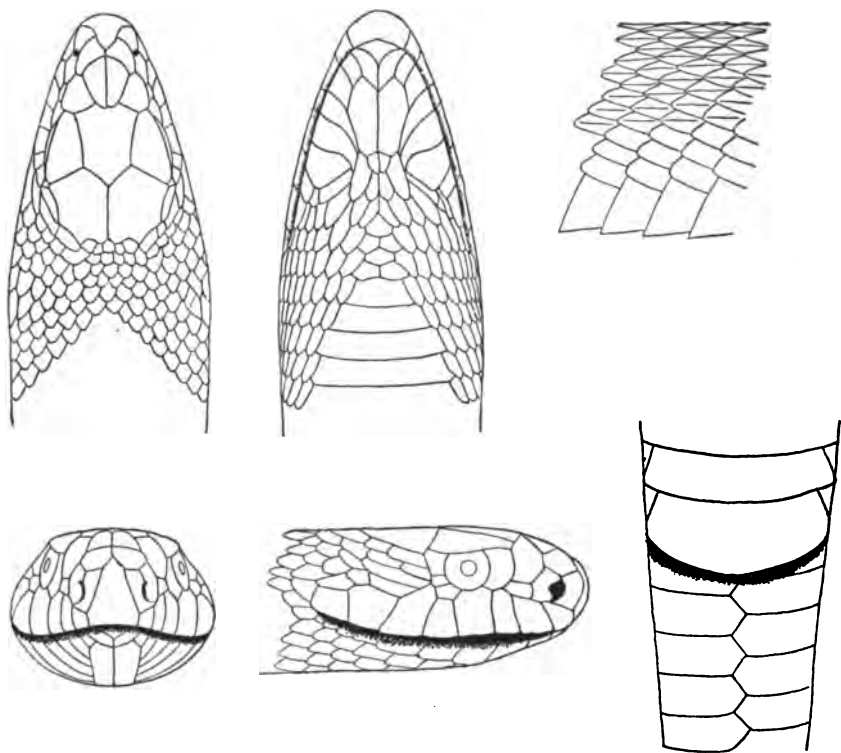


Fig. 203.

PITYOPHIS MELANOLEUCUS DAUDIN.

= 1.

Collection of E. D. Cope.

spots, but nearly white in the adult; frontal bar rather wide; postocular vitta broad in the young, but wanting in the adult. A dorsal series of very large blotches, of a deep chestnut-brown, broadly margined with black anteriorly and posteriorly. These blotches are twenty-four in number from the head to opposite the anus, and six on the tail, where they extend laterally down to the subcaudal scutellæ. More or less confluent, and consequently irregular in shape on the anterior third of the body, they are posteriorly subround or subquadrate, emarginated in front and behind, and separated from each other by a light space

embracing four scales, while the blotches themselves cover six scales. The flanks are blotched but very irregularly; on the anterior region of the body the blotches elongate in the shape of longitudinal bands or vittæ; on the middle region three indistinct series may be traced, alternating and often confluent by their corners; posteriorly there is only one series opposite to the dorsal, and often confluent with it, so that the corresponding blotches form single patches, extending from the back to the abdomen, and tapering on the sides. The abdomen is dull yellow, with a series of distant blackish brown patches along the extremity of the scutellæ, often extending to the outer row of scales.

Specimens from Florida have the dark colors, rusty or rufous, instead of deep brown or black, and the outlines of the spots are not so well defined.

This species ranges from New Jersey to Florida, preferring the sandy pine woods of the coastal plain. It is the largest snake of this region. It is of a very harmless disposition, and may be handled with impunity.

Pityophis melanoleucus Daudin.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4610	1	Mount Holly, New Jersey.	.....	Dr. Brown.....	Alcoholic.
8008	1	(?)	.....	.....	do.
8097	1	St. Johns River, Florida ..	— —, 1874	G. Brown Goode.....	do.
8045	1	do.....	.....	.....do.....	do.
10819	1	Gainesville, Florida.....	.....	James Bell.....	do.
10830	1	do.....	April 7, 1881	do.....	do.

PITYOPHIS SAYI Schlegel.

Pityophis sayi BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 151.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 39.

Coluber melanoleucus BOULENGER, part, Cat. Snakes Brit. Mus., II, 1894, p. 68.

Coluber sayi SCHLEGEL, part, Ess. Physionomie des Serpents, 1837, p. 157.

Head with the rostral plate more or less prominent forward and produced and narrowed upward and posteriorly. Superior labial plates 8-8 to 9-9. Scales in from twenty-seven to thirty-three rows, keeled, except six rows on each side. Dorsal spots more numerous than in *P. melanoleucus*, varying from fifty to sixty-five on the body, sometimes as few as forty. Two to three rows of spots on each side. Generally no subcaudal stripe. Head with three bands, one extending between the orbits, one from the orbit directly downward to the labial border, and one from the orbit to the angle of the mouth. Temporal scales small, generally 3-3 to 4-4, rarely 2-2.

This species occupies the entire interior of the United States and the Mexican plateau to the valley of Mexico. Eastward it crosses the Mississippi River into the prairie country of Illinois. It is represented by two forms, which only differ in the form of the rostral plate. One of these (*P. s. bellona*) inhabits Arizona and New Mexico only, and is

intermediate in character between the typical *P. s. sayi* and the *P. catenifer*. These forms differ as follows:

Rostral plate compressed and produced upward and backward; often traces of a black subcaudal stripe *P. s. sayi*.
 Rostral plate less compressed and less narrowed above; no traces of the black subcaudal stripe..... *P. s. bellona*.

PITYOPHIS SAYI SAYI Schlegel.

Pityophis sayi sayi COPPE, Check-list N. Amer. Batr. Rept., 1875, p. 39.

Pityophis sayi BAIRD and GIRARD, Cat. N. Am. Rept., Pt. 1, Serpents, 1853, p. 151.

Pityophis mexicanus DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 236.

Coluber sayi SCHLEGEL, Ess. Physionomie des Serpents, 1837, p. 157.

Pityophis macolellanii BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 68.

Pityophis mexicanus DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 236.

Head subelliptical, elevated. Rostral plate prominent, very narrow. Anteorbitals, none or two; postorbitals, three or four. Dorsals, 27-33

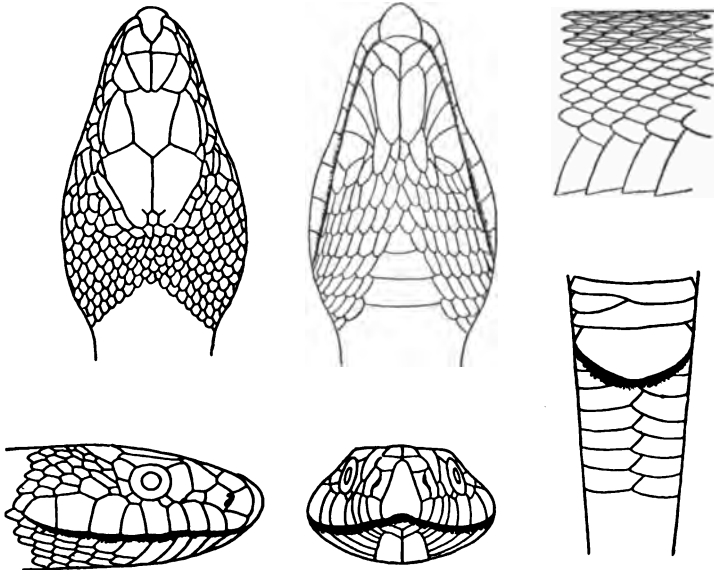


Fig. 204.

PITYOPHIS SAYI SAYI SCHLEGEL.

= 1.

Fort Custer, Montana.

Cat. No. 14532, U.S.N.M.

rows; the six outer rows smooth. Tail forming one-ninth or one-tenth of total length. Postocular vitta brown and rather broad. Suborbital black patch conspicuous; commissure of labials black. Color of body reddish-yellow, with a series of forty-five to sixty-five blotches from head to origin of tail. Blotches of adjoining series, on either side, confluent across the light spaces between medial blotches. Flanks covered with small blotches, forming three or four indistinct series. Twelve

transverse jet-black bars across the tail. Abdomen yellowish, thickly maculated with black patches.

Head proportionally large, ovoid, distinct from the body. Snout pointed. Parietal plates small. Frontal broad, subpentagonal, slightly concave on the sides. Superciliaries large. Internal prefrontals rather narrow, elongated; external prefrontals quadrilateral, a little broader forward. Internasals irregularly quadrangular. Rostral very narrow, extending halfway between the prefrontals, convex, and raised above the surface of the snout. Nostrils in the middle line between the nasals, the posterior of which is a little the smaller. Loreal trapezoidal, proportionally large. Inferior anteorbital very small, resting upon the fourth upper labial. Postorbitals varying in comparative size. Temporal shields small, resembling scales. Upper labials eight to nine, sixth and seventh the larger. Lower labials twelve, sixth and seventh largest. Posterior mental shields very small, extending to opposite the junction of the seventh and eighth lower labials. Scales proportionally small, in twenty-nine to thirty-three rows, the six outer ones perfectly smooth and somewhat larger than the remaining rows.

Ground color yellowish-brown, with three series of dorsal black blotches, forty-five to sixty-five in number, from the head to opposite the anus, with twelve on the tail, in the shape of transverse bars. Those of the medial series the larger, and covering eight or nine rows of scales. On the anterior part of the body they are subcircular, embracing longitudinally four scales; posteriorly they become shorter by one scale. The light spaces between are a little narrower than the blotches themselves for the twelve anterior blotches and wider than the blotches for the remaining length of the body. The blotches of the adjoining series alternate with those of the medial series, being opposite to the light intermediate spaces, across which the blotches of either side are generally united by a transversal narrow band. The flanks are densely covered with small and irregular blotches, forming three indistinct series, confluent in vertical bars toward the origin of the tail. Inferior surface of the head yellowish, unicolor. Abdomen dull yellow, with crowded brownish-black blotches in series on the extremity of the scutella.

Baird and Girard give the following numbers of scuta and scales, with dimensions in inches:

Cat. No. 1540; Red River, Arkansas; gastrosteges, 231; urosteges, 52; rows of scales, 35; total length, 38½; tail, 4½.

Another specimen, same locality; gastrosteges, 231; urosteges, 52; rows of scales, 33; total length, 24½; tail, 2½.

I add the following:

Cat. Nos.	Locality.	Gastrosteges.	Urosteges.	Scales.
1516.	Rush Lake, Sonora.....	219.	63.	27.
1548.	Lower Rio Grande, Texas.....	238.	46.	31.
1561.	Rock Island, Illinois.....	221.	59.	27.
1543.	Poplar River, Montana.....	215.	60.	29.

This subspecies ranges from western Canada to the Valley of Mexico, inclusive. It is the common species of Texas, and even occurs in Sonora. It is a curious fact that this form has both the extreme northern and southern ranges, while the Arizonian form is so restricted.

Two living specimens of this form were under my observation for a number of months. Their hissing was remarkably loud and prolonged, and they threw the tail into rapid vibrations, as do rattlesnakes, etc. They would not eat, and died of starvation.

Pityophis sayi sayi Schlegel.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1575	1	Southern Illinois.....	R. Kennicott.....	Alcoholic.
1561	1	Rock Island, Illinois.....	J. D. Sergeant.....	do.
1559	1	do.....	do.....	do.
5233	2	Nebraska.....	J. Reynolds.....	do.
1518	1	Rush Lake, Sonora.....	do.....	do.
1558	2	Fort Snelling, Minnesota.....	do.....	do.
1532	1	Anton Chico, Texas.....	do.....	do.
10799	1	Davenport, Iowa.....	D. S. Sheldon.....	do.
14532	4	Fort Custer, Montana.....	Capt. C. Bendire.....	do.
15685	1	San Diego, Texas.....	W. Taylor.....	do.
1475	1	Mexico.....	do.....	do.
1543	1	Poplar River, Montana.....	Dr. G. Suckley.....	do.
5465	1	Platte River Valley.....	do.....	do.
1548	1	Lower Rio Grande, Texas.....	do.....	do.
1553	1	Upper Missouri.....	do.....	do.
9128	1	Yellowstone River.....	Mr. Allen.....	do.
1540	2	Red River, Texas.....	Capt. G. B. McClellan, U. S. A.....	do.
9321	2	Yellowstone River.....	J. H. Beatty.....	do.
22139-41	.....	Las Cruces, New Mexico, Experiment Station.....	T. D. A. Cokerell.....	do.
14744	.....	Fort Huachuca, Arizona.....	Benson.....	do.
17791	.....	do.....	Wilcox.....	do.
19675	.....	do.....	do.....	do.

PITYOPHIS SAYI BELLONA Baird and Girard.

Pityophis sayi bellona COPE, Check-list N. Amer. Batr. Rept., 1875, p. 39.

Pituophis bellona BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 66.

Churchillia bellona BAIRD and GIRARD, Reptiles, Stansbury's Rept. Expl. Great Salt Lake, 1852, p. 350.

Head elliptical, rather pointed, little compressed. Vertical plate very broad anteriorly. A second anterior vertical, small, and subcordiform. Anteorbitals two; postorbitals four. Dorsal rows of scales twenty-nine to thirty-three; the seven outer rows smooth. Tail about one-twelfth of total length. Head maculated with black; transverse frontal bar extending from one orbit to the other, well marked; the oblique post-ocular vitta rather narrow, and reaching the angle of the mouth. Color of the body whitish yellow, sometimes reddish yellow, with a dorsal series of deep black blotches, or of deep brown, margined with black, forty-five to sixty-three in number, from the head to the origin of the tail, and a series of smaller spots on each side. Ten transverse jet black bars on the tail. Flanks crowded with small and irregular blotches. Abdomen dull yellow, maculated with black blotches more or less crowded.

Head broad behind, and well separated from the body by a con-

tracted neck, very much tapering to the end of the snout, subquadrangular from the eyes forward. Upper surface flattened; snout elevated and rounded. Occipital plates triangular, as broad anteriorly as long. Superciliaries longer than either the vertical or occipitals. Frontal subpentagonal, very broad anteriorly, as broad as long, and very much tapering posteriorly; its sides concave. A second small subcordiform anterior frontal sometimes present; is situated between the external prefrontals, which are comparatively the larger. Internal prefrontals irregularly triangular, and smaller than the internasals, which are irregularly quadrangular. The rostral is triangular, wide below and narrow above, and raised but little above the surface of the snout, not dividing, however, the prefrontals. Nasals subquadrangular, anterior one a little larger; nostrils situated between the two plates, but more in the posterior one. Loreal very small, narrow, and elongated, horizontal in position. Two anteorbitals, inferior one very small; upper one very

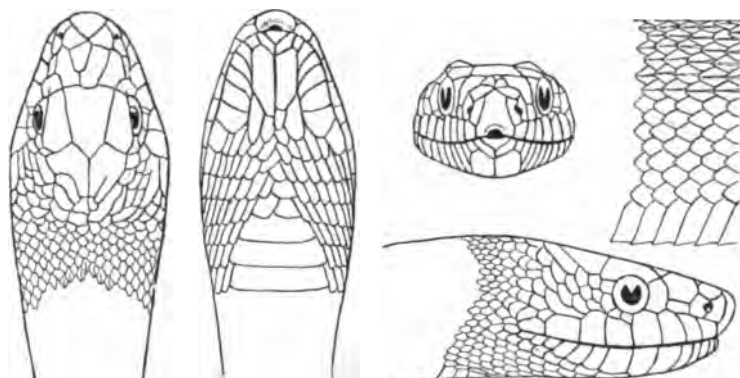


Fig. 205.

PITYTOPHIS SAYI BELLONA BAIRD AND GIRARD.

= 1.

regular, slightly convex on its anterior margin. Postorbitals four in number, occasionally only three, the two upper ones a little larger. Numerous small temporal shields. Upper labials eight (rarely nine), sixth and seventh somewhat larger. Lower labials thirteen, seventh largest; the six posterior ones the smallest. Dorsal scales elliptically elongated, constituting twenty-nine to thirty-three rows, the six outer of which are smooth, the others carinated, the five outermost very sensibly the larger.

The ground color is whitish yellow; on the anterior third and upper part of the body, the bases and sometimes the two anterior thirds of the scales are jet black, so as to make the ground color appear black. There are fifty-one large chocolate-brown dorsal blotches, margined with jet black from the head to opposite the anus, and ten on the tail. On the anterior portion of the body these blotches are subcircular, or rather elliptical, covering in width seven or eight rows of scales, and

four and two half-scales in length; the spaces between embrace about two scales. Posteriorly the blotches become quadrate, and the intermediate spaces increase so as to be at first equal to the blotches, and toward the origin of the tail they are actually wider by one scale than the blotches themselves. On the tail the blotches assume the shape of narrow transverse bars, tapering downward. On each side of the dorsal blotches is a series of much smaller and somewhat irregular blotches margined with black, the blotches being opposite to the light spaces, alternating, but not confluent with the medial blotches. On the anterior third of the body a series of small blotches is observed on the

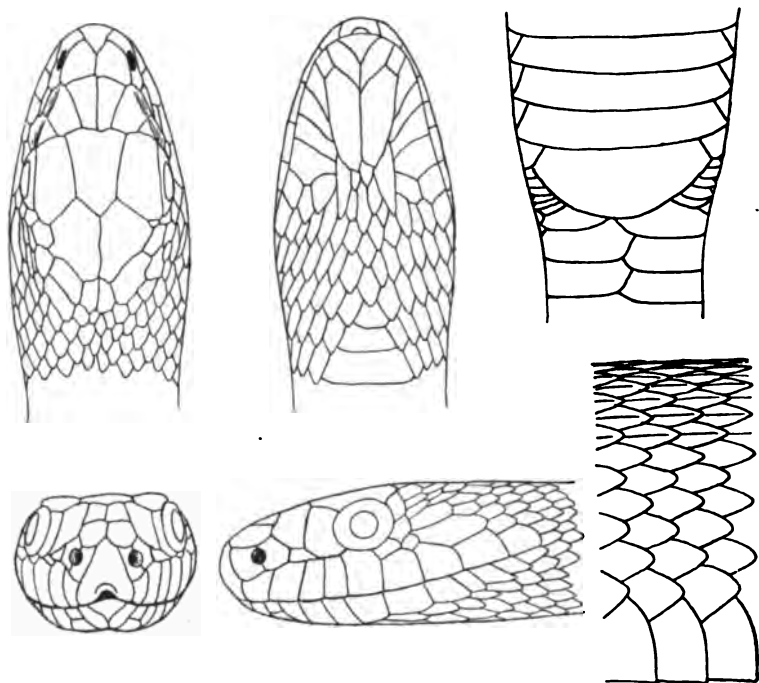


Fig. 206.

PITTOPHIS SAYI BELLONA BAIRD AND GIRARD.

= 1.

Second specimen, showing variations.

flanks, and beneath it a series of elongated black patches, all of which exhibit a tendency to become obsolete vertical bars, more apparent posteriorly in very large individuals, giving to the flanks a nebulous appearance. The head above is yellowish brown, with small black spots on the vertex and occiput. Frontal black bar distinct in small individuals, obsolete in very large ones; postorbital vitta narrow; sub-orbital spot small. Inferior surface of the head and abdomen light straw color, with an external series of distant black spots on each side, confluent under the tail, and constituting a medial band. Tail neither ringed nor longitudinally striped below with brown or black.

Baird and Girard give the following scutal formulæ and measurements, the latter in inches:

Cat. No.	Locality.	Gastrosteges.	Urosteges.	Scales.	Length.	Tail.
1520.	Rio Grande.....	231.	53.	33.	61 $\frac{1}{4}$.	5 $\frac{1}{4}$
	Fort Webster, Santa Rita del Cobre.	225.	63.	31-33.	44 $\frac{1}{4}$.	6 $\frac{1}{4}$
	Do	225.	63.	31.	39.	5 $\frac{1}{4}$

I add the following:

Cat. No.	Locality.	Gastrosteges.	Urosteges.	Scales.
8404.	Pagosa, California.....	231.	65.	29
8400.	Oak Orchard, Arizona.....	225.	58.	29

Of sixteen specimens examined, twelve have 8-8 superior labials, two have 8-9, and two have 9-9. Four have twenty-nine rows of scales, nine have thirty-one, and two have thirty-three. Six have between forty and fifty dorsal spots on the body; eight have between fifty and sixty, and two have sixty to sixty-three. About two-thirds have the centers of the dorsal spots paler than the borders, and the remainder have the spots black throughout. The only constant character of this subspecies as compared with *P. sayi* is the form of the rostral plate; but Cat. No. 8401 is intermediate between the two in this respect. Some specimens from Oregon are intermediate between it and the *P. catenifer*.

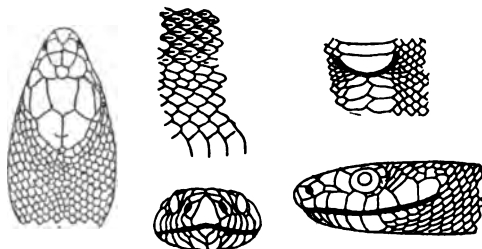


Fig. 207.

PITYOPHIS SAYI BELLONA BAIRD AND GIRARD.

Figure copied from Baird in Report U. S. Pacific R. R. Survey, X, pl. xxix.

The geographical range of this subspecies is the Great Basin from Oregon south, the basin of the Colorado, and Arizona.

The typical specimen of the *Churchillia bellona* Baird and Girard, which can not now be found, came from the valley of the Rio Grande, which is also the habitat of the *P. sayi sayi*. The second specimen enumerated in Baird and Girard's Catalogue under the *P. bellona* is from western Texas, between San Antonio and El Paso, and hence from the same region as the type. This specimen belongs to the *P. sayi sayi*.

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Pityophis sayi bellona Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8401	1	New Mexico.....	Sept. —, 1874	Dr. H. C. Yarrow.....	Alcoholic.
8405	1	do	Sept. 24, 1874	Yarrow and Aiken.....	do.
8406	1	do	June —, 1874	H. W. Henshaw.....	do.
8402	1	Colorado Chiquito, New Mexico.	July —, 1874	do.....	do.
8130	2	Fillmore, Utah.....	— —, 1872	Dr. H. C. Yarrow.....	do.
1533	1	Fort Conrad, New Mexico.	.....	.....	do.
1520	1	Santa Rita del Soto.....	.....	.....	do.
4652	1	Southern fork Humboldt River.	.....	.....	do.

Pityophis sayi bellona Baird and Girard—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8004	2	Camp Grant, Arizona.....	.....	.....	Alcoholic.
1534	1	Colorado Bottom.....	.....	Maj. W. H. Emory, U. S. A.	do.
8758	1	Fort Wingate, New Mexico.	— —, 1873	Dr. C. G. Newberry.....	do.
4846	1	Salt Lake, Utah.....	.....	.....	do.
8759	1	Pagosa, Colorado.....	— —, 1874	C. E. Aiken.....	do.
10812	1	Columbia River, Oregon..	Sept. 19, 1878	H. W. Henshaw.....	do.
8403	1	Wilton Springs, Arizona..	July —, 1874	Dr. J. T. Rothrock.....	do.
8407	1	Gila River, Arizona.....	— —, 1874	Dr. J. S. Newberry.....	do.
8565	1	St. Martin's Island, Lower California.	.....	Dr. T. H. Streets, U. S. N.	do.
16616	.....	Tucson, Arizona.....	.....	P. L. Jouy.....	do.
16766-7	.....	Fort Wingate, New Mexico.	.....	Dr. R. W. Shufeldt.....	do.
17063	.....	Cameron County, Texas..	.....	C. K. Worthen.....	do.

PITYOPHIS CATENIFER Blainville.

Pityophis catenifer BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 69.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 87.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 39.

Coluber catenifer BLAINVILLE, Nouv. Ann. Mus. Hist. Nat. Paris, III, 1834, pl. xxvi, figs. 2, 2a, 2b.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 67.

Pituophis annectens BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 72.

Pituophis wilkesii BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 71.

Pityophis heermanni HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1853, p. 236.

Pityophis vertebralis HALLOWELL, U. S. Pac. R. R. Surv. Rept., X, 1859, Williamson's Report, p. 14.

Head elongated, more or less depressed forward. Frontal plate pentagonal, much broader anteriorly than posteriorly. Rostral broad. Anteorbitals two; postorbitals three. Loreal trapezoidal. Dorsal rows of scales twenty-nine to thirty-one; three outer rows smooth. Tail one-sixth or one-seventh of total length. Frontal black bar well marked. Postocular vitta extending over the last upper labial to the angle of the mouth. Color of body whitish yellow on the sides, reddish yellow above, with a dorsal series of subquadrate blotches, fifty to seventy in number, from the head to origin of the tail, and proportionally smaller than in any other species. The blotches of the two adjoining series not confluent with those of the medial one.

Head elongated, subelliptical, more or less depressed anteriorly. Parietal plates much longer than broad, longer than either the frontal or superciliaries. Frontal pentagonal, concave laterally, tapering; length greater than the width of its anterior margin. External prefrontals sometimes longitudinally divided into two plates. Internal prefrontals elongated, very narrow posteriorly, sometimes also subdivided. Rostral broad, not separating the prefrontals. Nasals equal in size; nostrils intermediate and nearer to the frontals than labials. Loreal not very large. Inferior anteorbitals small, and situated between the fourth and fifth upper labials. Postorbitals nearly equal in size, and generally contiguous to the anterior ones, thus excluding the labials

from the orbit, into which, however, the fifth occasionally enters. Temporal shields scarcely to be distinguished from the scales. Upper labials eight or nine, fourth or fifth occasionally coming into the orbit, penultimate the largest. Lower labials twelve or thirteen, fifth or sixth the largest, the six posterior ones very much reduced. Dorsal scales elliptical, forming twenty-nine to thirty-one rows, the three outer rows perfectly smooth, slight carinae on the eighth, ninth, or tenth rows, and not very conspicuous on the remaining ones. Tail conical and tapering.

Ground color yellowish, with a dorsal series of subquadrate blotches, about ninety in number, twenty of which on the tail. These are deep brown, margined with black anteriorly, entirely black posteriorly; these blotches cover transversely eight or nine rows of scales, embrac-

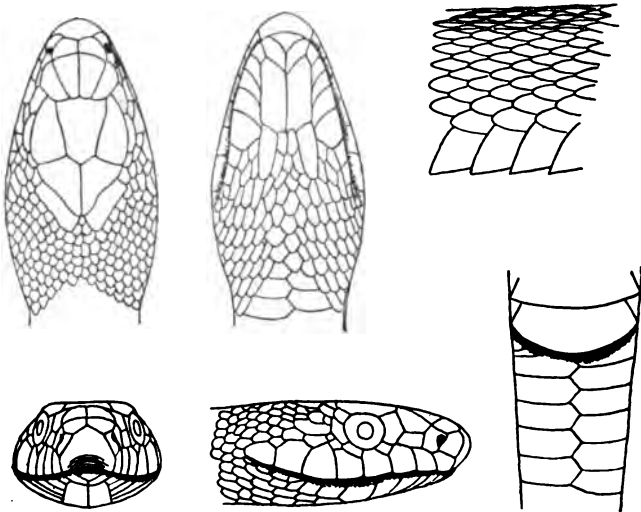


Fig. 208.

PITYOPHIS CATENIFER BLAINVILLE.

= 1.

Humboldt Bay, California.

Cat. No. 1804, U.S.N.M.

ing longitudinally five to seven scales on the anterior region of the body, and two or three posteriorly. The spaces between the blotches are of the width of one to two scales for the whole length of the body, as in *P. sayi*. A lateral series of blotches on each side of the medial, covering three rows of scales, and alternating with the median series. A series of blotches along the middle of the flanks opposite to those of the median dorsal series. On the anterior part of the body the lateral blotches are elongated and occasionally combine into a band or vitta behind the neck. On the anterior third of the body an indistinct series of black spots may be seen between the scuta and the outer series of lateral blotches. Inferior surface of head and abdomen dull yellowish white with two series of distant blotches, the outer series more conspic-

nous than the inner and extending to the end of the tail. The latter is not ringed and has no stripe on the middle line below.

In the young the middle region of the abdomen is unicolor, and the external series of spots only exists, which, together with the series on the middle of the flanks, are most conspicuous.

Baird and Girard give the following numbers of scuta and scutella; and total lengths, with that of the tail, in inches:

Locality.	Gastrosteges.	Urosteges.	Scales.	Length.	Tail.
Puget Sound, Washington	215.	56.	29-31.	39½.	5½.
Do	209.	72.	29-31.	41½.	7½.
Oregon	209.	66.	29.	14½.	1½.
Do	213.	†	29.	13½.	1½.

Of seventeen specimens examined, seven have the superior labials 8-9; eight have 8-8; and two have 9-9. Four have twenty-nine rows of scales; ten have thirty-one rows; one has thirty-three; and one has thirty-five (Cat. No. 2243). The number of spots on the body is very variable. One has thirty-six dorsal spots (Cat. No. 1546); one has forty-six (Cat. No. 1532); seven have between fifty and sixty; four have between sixty and seventy; and four have over seventy, the highest being seventy-nine (Cat. No. 1816). The specimen (Cat. No. 5741) on which the *P. wilkesii* Baird and Girard was founded is abnormal in the nondivision of the prefrontal scuta; the only example I have observed in the genus.

The range of this species is coterminous with the Pacific region, extending from San Diego on the south to Puget Sound on the north. It is found in the Mohave Desert, and at Pymont, Nevada (Cat. No. 8139). Northward it extends to eastern Oregon and to Walla Walla, Washington.

Ptyophis catenifer Blainville.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
5469	1	San Francisco, California.	.....	.....	Alcoholic.
1816	1	Monterey, California.	.....	.....	do.
1810	1	Pitt River, Oregon.	.....	.....	do.
1822	1	Wemas River.	.....	Dr. J. G. Cooper	do.
2243	1	Petaluma, California.	.....	Mrs. M. E. Daniel	do.
8582	1	Santa Barbara, California.	Oct. —, 1874	H. W. Henshaw	do.
1839	2	San Diego, California.	.....	Dr. J. LeConte	do.
12582	1	Walla Walla, Washington.	.....	Capt. C. Bendire	do.
8594	1	Southern California.	Aug. —, 1875	H. W. Henshaw	do.
8592	1	Santa Barbara, California.	July —, 1875	do.	do.
8670	1	do.	July —, 1875	Dr. H. C. Yarrow	do.
8590	1	Kernville, California.	Oct. —, 1875	H. W. Henshaw	do.
9103	1	Fort Crook, California.	.....	J. Feldner	do.
8591	1	Mohave Desert, California.	July —, 1875	Dr. O. Loew	do.
10731	1	Monterey, California.	— —, 1880	Prof. D. S. Jordan	do.
10633	1	Fort Walla Walla, Washington.	— —, 1880	Capt. Chas. Bendire, U. S. A.	do.
1550	2	Near latitude 38°	!.....	!.....	do.
1546	1	San Bernardino, California.	!.....	!.....	do.
2287	1	Fort Steilacoom, Washington.	!.....	Dr. Geo. Suckley	do.
5471	1	Puget Sound, Washington.	!.....	U. S. Exploring Expedition.	do.
8003	3	Fort Tejon, California.	!.....	J. Xantus	do.
8139	1	Pymont, Nevada.	— —, 1872	Dr. H. C. Yarrow	do.
1804	1	Humboldt Bay, California.	.....	Lieut. W. P. Trowbridge, U. S. A.	do.

Pityophis catenifer Blainville—Continued.

U.S.N.M. No.	Locality.	When collected.	From whom received.	Remarks.
18003	South Fork Kings River, California.	Aug. 17, —	Palmer	7,000 feet altitude, Bubbs Creek.
18064	Old Fort Tejon, California	July 8, —	do	

Catalogue No.	Locality.	From whom received.
14128	San Diego, California	C. R. Orcutt.
16344	San Diego County, West of mountains, California.....	do.
16350	Near Orcutt, San Diego County, California.....	do.
16495	Marshall, Washington.....	U. S. Department of Agriculture.
21481	Witch Creek, San Diego County, California.....	H. W. Henshaw.
22034	Campbell's Ranch, summit Coast Range, San Diego County, California.	Dr. E. A. Mearns.
22035	Gardner's Laguna, Salton River, Lower California.....	do.
22578	City Park, San Diego County, California.....	C. R. Orcutt.

PITYOPHIS VERTEBRALIS Blainville.

Pityophis vertebralis DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 238.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 39; Bull. U. S. Nat. Mus., No. 32, 1887, p. 72.

Coluber vertebralis DE BLAINVILLE, Nouv. Ann. Mus. Nat. Hist. Paris, III, 1834, p. 61, pl. XXVII, figs. 2, 2a, 2b.—BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 152.—BOULENGER, part, Cat. Snakes Brit. Mus., II, 1894, p. 67.

Pityophis hamatois COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 342.

Scales in from thirty-one to thirty-five rows, the exterior ten or twelve entirely smooth, the central faintly carinate; the scales three times as wide as long near the middle of the body.

Head distinct, elongate, depressed, especially upon the region of the coronal suture. Occipital shield as long as the vertical, but subject, as in other species of the genus, to subdivision. Length of the vertical, one and a half times the anterior breadth, the superciliary borders concave and slightly divergent posteriorly. Posterior angle obtuse. Postfrontals four, elongate, all bordering the vertical. Rostral not prominent; as broad as high, possessing six sutural borders, the nasal twice as long as any of the others. Nasal shields large, loreal longer than high. Preoculars normally two, sometimes three or one. Postoculars three, exceptionally four. Superior labials normally nine (exceptionally ten), the fifth entering the orbit. Inferior labials normally twelve; geneials two pair, anterior twice the length of the posterior. Tail one-seventh of the total length. Gastroteges two hundred and forty-seven, an entire anal, urosteges sixty-one.

Measurements.—Total length, 5 feet 4 inches; tail, 9 inches.

The ground color above and below is a rich straw-yellow. The muzzle is shaded anteriorly with ashy or brown; this color gradually fades into a lively sanguineous or testaceous, which tint prevails upon the posterior part of the head and anterior part of the body. There arises upon the tenth or eleventh row of the scales of the neck upon each side

a longitudinal band of the same color, which deepens posteriorly, and unites with its fellow at intervals of three or four scales by a gradual widening upon its dorsal border. Thus a scalariform series of dorsal blotches is formed, whose transverse diameter increases regularly posteriorly, and whose intervals diminish, being anteriorly four scales, upon the tail one and a half. The connecting band remains unbroken upon the anterior fourth of the body only. Separated from this by an interval of one half or a whole scale, another longitudinal and very narrow band arises on the neck. It is much more distinct opposite the

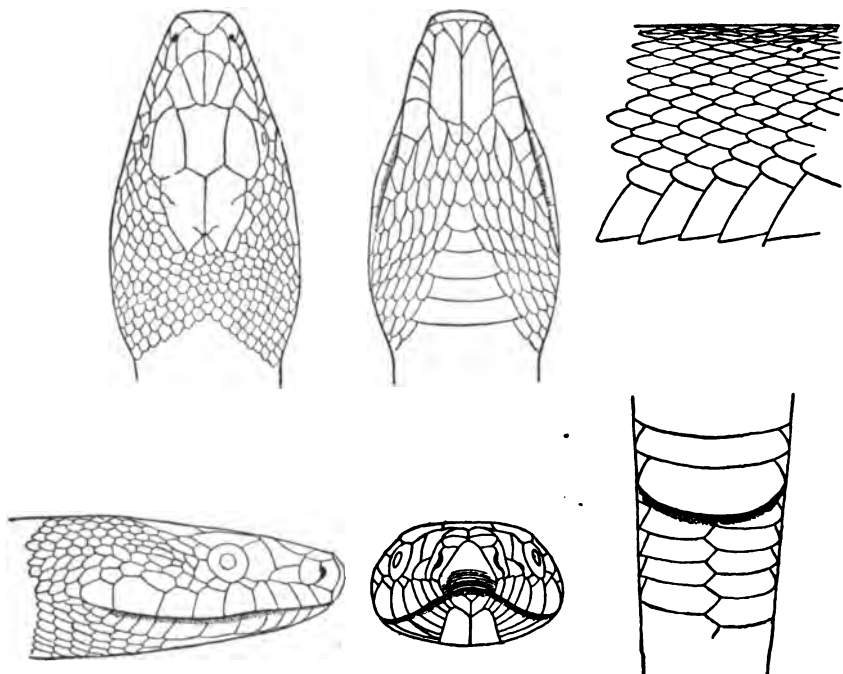


Fig. 209.

PITYOPHIS VERTEBRALIS BLAINVILLE.

= 1.

La Paz, Lower California.

Cat. No. 12644, U.S.N.M.

intervals between the dorsal blotches, and upon the disappearance of the line connecting the latter partially assumes its position, and breaks up into an alternating series of very elongated spots. The dorsal intervals are thus widened to a breadth of seven and two halves scales. There also begins upon the neck a second lateral series of spots, which occupy a length of five scales on the fourth, fifth, and sixth rows. Their length decreases to three scales opposite the anus, where they unite with the superior lateral series. Every second pair of gastrosteges is tipped with sanguineous. All the markings of this serpent are sanguineous anteriorly, but deeper posteriorly, passing through

shades of maroon, until upon the terminal third of the total length they are entirely black. A black or maroon band passes along the suture of the urosteges. Belly immaculate.

Habitation.—Cape St. Lucas, Lower California.

Fityophis vertebralis Blainville.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4682	4	Cape St. Lucas, Lower California.	.....	John Xantus.....	Alcoholic.
12631	1	La Paz, Lower California.	Feb., 1882.	L. Belding.....	do.
12644	1	do	Feb., 1882.	do.....	do.
15157	.....	Ballenas Bay, Lower California.	.....	U. S. Fish Commission...	

OSCEOLA Baird and Girard.

Osceola BAIRD and GIRARD, Cat. Rept. N. Amer., Pt. 1, Serpents, 1853, p. 133.—COPE, Trans. Amer. Phil. Soc., 1895, p. 204.

Posterior maxillary teeth larger and more robust than the anterior, not separated from them by an interspace. Hemipenis colubiform, with numerous fringed calyces. Cephalic plates normal; anal plate entire; urosteges two rows. Scales with two apical pits.

This genus is intermediate between the Coronelline type of snakes and the Colubrine. The scutellation and dentition are identical with those of the genus *Ophibolus*, but the hemipenis is of a very different character, being identical with that of *Coluber*, *Phrynonax*, etc. The dentition separates it rather weakly from the latter genus. It ranges from the eastern district of the Medicolumbian to the Columbian region of the Neotropical realm, inclusive.

I know of but two species of this genus. They were formerly referred to *Ophibolus*. They differ as follows:

Temporal scuta 2-2-3; scales in 21 rows; a loreal; spotted or annulate, larger.

O. doliata Linnæus.

Temporal scuta 1-2-3; scales in 17-19 rows; no loreal; annulate; smaller.

O. elapsoides Holbrook.

OSCEOLA DOLIATA Linnæus.

Osceola doliata COPE, Trans. Amer. Phil. Soc., 1895, p. 215.

Ophibolus doliatus BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 89.—COPE, Check-list N. Amer. Batr. Rept., 1875, pp. 4, 36; Proc. U. S. Nat. Mus., XI, 1888, p. 381.

Coluber doliatus LINNÆUS Syst. Nat., I, 1766, p. 379.—GMELIN, Linnæus Syst. Nat., 13th ed., I, Pt. 3, 1788, p. 1096.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 362.

Coronella doliata HOLBROOK, N. Amer. Herpt., III, 1842, p. 106, pl. 24.—DUMÉRIL and BIBRON, Erp. Gén., VII, p. 621.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 41.

Coronella coccinea SCHLEGEL, Essai Phys. Serp., I, 1837, p. 135; II, p. 57.

Scales in twenty-one rows, rather wide. Tail rather short, entering total length six and two-thirds times. Head rather flat, little distinct.

Loreal small, longer than high; one preocular, two postoculars. Temporals 2-2 (rarely 1-2). Frontal rather wide, narrowing the superciliaries in front. Parietals rather wide, the length a little less than that of frontal and prefrontals combined. Seven superior labials, all higher than long except the first, the third and fourth bounding the orbit. Geniials, the anterior about twice the size of the posterior. Size medium to small.

The ground color of the superior surfaces varies from ashen to bright yellow, but it only appears as transverse spaces between the broad reddish-brown to crimson spots or saddles which cross the back. The extent to which these spots preserve their outlines or surround the body like rings forms the indication of the characters of various subspecies. The coloration of the head varies from red or black abruptly cut off posteriorly, to banded with two chevrons, a brown within a yellow one, with a yellow cross-band on the nose.

The variations of this species are remarkable and form the subject of some remarks I made on former occasions, and which I now quote:¹

The most northern and the most southern forms of the genus *Oseola*, the *O. triangular* and *O. coccinea*, have always been regarded as distinct species; and so numerous are their differential characters in coloration, size, and squamation that this view would seem to rest on a satisfactory foundation. I find, however, that individuals exist which represent every stage of development of each character which distinguishes them, although certain types appear to be more abundant than the intermediate ones. *O. triangular* is a species of larger size, with two temporal plates, a row of large brown dorsal spots, and other smaller ones on the sides, on a grayish ground, with a chevron, and often other marks on the top of the head, and a band posterior to the eye. *O. coccinea* is a small snake with a small loreal plate and one temporal shield; color red, with pairs of black rings extending round the body, and no markings on the head excepting that the anterior ring of the anterior pair crosses the posterior edge of the occipital shields, forming a half collar. The transition is accomplished thus: The lateral borders of the dorsal spots of *O. triangular* break up, and the lateral spots become attached to their anterior and posterior dark borders. The chevron of the top of the head first breaks into spots, and then its posterior portions unite with each other. The borders of the old dorsal spots continue to the abdomen, where the remaining lateral portions finally meet on the middle line, forming a black line. This breaks up and disappears, leaving the annuli open; and these are then completed in many specimens. The general colors become more brilliant and the size smaller. The head is more depressed; in immediate relation to this form, the loreal plate is reduced in size, and the two temporal shields of *O. triangular* are sometimes reduced to one. Every form of combination of these characters can be found, which represent five species of the books (in North America), viz: *O. triangular*, *O. doliata*, *O. annulata*, *O. gentilis*, and *O. coccinea*. The oldest name is the *O. doliata* Linn. Another series of specimens resemble very closely those of the subspecies *coccinea*; in fact, are identical with them in color. The loreal shield is, however, extinguished, and the rows of scales are reduced by one on each side. These specimens simply carry one degree further the modifications already described. Yet, on account of the constancy of these characters, I am compelled to regard these individuals not only as a distinct species, but, on account of the absence of the loreal plate, as belonging to another genus. This is the *Calamaria elapsoides* of Holbrook; the *Oseola elapsoides* of Baird and Girard. It affords an illustration

¹ Bull. U. S. Nat. Mus., 1875, p. 4; Proc. U. S. Nat. Mus., 1888, p. 381.

of the principle, which I have elsewhere insisted on, "that adjacent species of allied genera may be more alike than remote species of identical generic characters," which indicates that generic characters originate independently of the specific.

The transitions above noted are not, however, without mutual correlations. The characters are found so associated in such a great majority of the specimens as to indicate the existence of subspecies whose definitions are given below. Exceptions to these are given under the head of each subspecies.

I. No yellow band posteriorly from orbit (a yellow half collar).

α . Dorsal spots or saddles (red) open at the side, their adjacent borders forming pairs of black rings.

Interspaces between red saddles open below; scales not black tipped; front black; first black ring on nape only *O. d. coccinea*.

Interspaces between red saddles closed by black spot below; scales black tipped; front black; first black ring complete *O. d. polyzona*.

Interspaces not closed; rings, including first, complete on belly; first yellow band crossing occipital plates; front black; scales not black tipped *O. d. occipitalis*.

$\alpha\alpha$ Dorsal saddle spots closed at the sides.

β Saddles closed by a single black tract on the middle of the belly; no spots between saddles.

Dorsal spots undivided medially; front black; first black ring complete.

O. d. annulata.

Dorsal spots divided longitudinally by a median black connection; front black *O. d. gentilis*.

$\beta\beta$ Lateral borders of saddles not confluent with each other below.

Saddles completed on gastrosteges; no alternating spots; no black collar *O. d. parallela*.

Saddles completed on gastrosteges; spots opposite intervals forming a single series on the middle line of the belly *O. d. sypila*.

Saddles completed above the gastrosteges; alternating spots which do not meet on the middle line of the belly *O. d. doliata*.

II. A yellow band from orbit bounded below by a black or brown one. (Saddle spots closed laterally above gastrosteges; superciliary light spots or bands.)

A half collar touching occipital plates, no bands; alternate spots largely on gastrosteges *O. d. collaris*.

Neck with longitudinal bands; alternate spots largely on gastrosteges.

O. d. clerica.

Neck with bands; alternate spots entirely on scales *O. d. triangula*.

The more detailed transition from the simple head coloration of the *O. d. coccinea* to the complex pattern of the *O. d. triangula* is accomplished as follows:

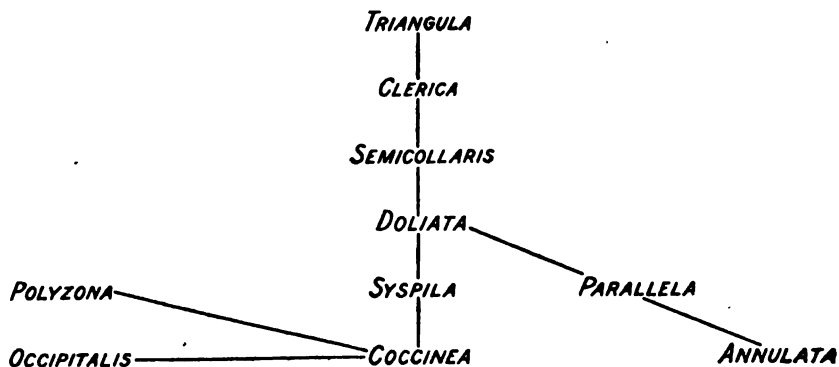
A yellowish spot is seen on the superciliary plate of the single specimen of the *O. d. parallela* known, and on three of the fifteen specimens of the *O. d. sypila*. It appears in all of the thirteen *O. d. doliata*, and in two of these they nearly join across the front, and in three they join forming a cross band. In four specimens of the *O. d. doliata* a notch of the black anterior border of the nuchal collar appears on each side. The depressing of this notch till it reaches the eye defines the two post-ocular stripes of the subspecies of Section II of the preceding table.

It has not quite reached the orbit in Cat. Nos. 7849 and 2192 of the *O. d. collaris*. The superciliary spots have not united across the front in any of the five specimens *O. d. collaris*, excepting in Cat. No. 5449. In Cat. No. 2433 it is nearly completed. The interorbital and postorbital bands are complete in the subspecies *O. d. clerica* and *O. d. triangula*. Finally, the completion of the head ornamentation is seen in the perfect definition of the anterior boundary of the brown band in front of the interorbital light band. This is seen in three individuals of the *O. d. doliata*, in four of the *O. d. collaris*, all of the *O. d. clerica*, and in three of the five *O. d. triangula*. In one of the latter it is simply indistinct; in another it is converted into a median spot by a yellow band, which extends from the interorbital band around the canthus nostralis and end of muzzle.

This species furnishes them a most instructive illustration of the origin of color characters.

The geographical distribution of the *Osceola doliata* extends from latitude 48° through the eastern Austroriparian and southern part of the central district, and throughout Mexico and Central America to Panama. It is wanting from the Pacific and from the Sonoran districts. It does not appear on the west coast of Mexico north of Colima and Michoacan.

The phylogenetic relations of these subspecies may be sketched as follows:



Which is the ancestral form is uncertain, but as the region inhabited by the *O. d. triangula* is much older geologically than that where the *O. d. coccinea* is found, the former is probably the primitive type.

The geographical distribution of the subspecies is related to their characters. *O. d. coccinea* is exclusively a form of the Gulf border, and *O. d. triangula* is northern, and is not recorded from south of Washington, District of Columbia. The other found in the same series occupy the intermediate latitudes. The *polyzona*, *occipitalis*, and *annulatas* are Mexican, and the *O. d. parallela* is Floridan. The color increases in brilliancy to the south, as the *O. d. triangula* is brown spotted and the *O. d. coccinea* crimson. The size diminishes in general in the same direction, the species recovering its size in Mexico.

OSCEOLA DOLIATA TRIANGULA Boie.

Ophibolus doliatus triangulus COPE, Check-list N. Amer. Rept. Batr., 1875, p. 37; Proc. U. S. Nat. Mus., XI, 1888, p. 383.

Coluber triangulum BOIE, Isis von Oken, 1827, p. 537.

Ablabes triangulum DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 315.—HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1856, p. 245.

Lampropeltis triangula COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 256.

Pseudoeclaps Y BERTHOLD, Abh. k. Gess. Wiss., Göttingen, I, 1843, p. 67, pl. 1, figs. 11, 12.

Coluber eximius DEKAY, N. York Fauna, Rept., 1842, p. 38.—HARLAN, Journ. Acad. Nat. Sci. Phila., 1827, p. 360.—HOLBROOK, N. Amer. Herpt., III, 1842, pl. 15.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 91.

Ophibolus eximius BAIRD and GIRARD, Cat. N. Amer. Rept., 1858, p. 87.

Coronella triangulum BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 200.

Muzzle rather broader, and the head more depressed than in the species of the genus allied to *O. getulus*; in other respects generally similar, like them having all the scales hexagonal, those on the back scarcely narrower than those on the sides, although rather more elongated than usual. Vertical longer than broad, shorter than the occi-

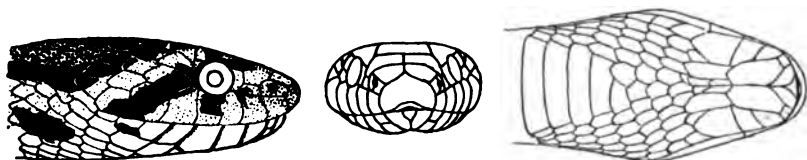


Fig. 210

OSCEOLA DOLIATA TRIANGULA BOIE.

= 1.

Westchester County, New York.

Collection of E. D. Cope.

pitals. General color above yellowish-gray, with a dorsal series of large blotches, fifty-five in number from the head to the tip of the tail, the forty-fifth opposite to the anus. These are transversely elliptical, about four scales long, covering twelve to fifteen scales across the back (more anteriorly than posteriorly), and separated by intervals of one and a half to two scales, all of nearly the same width. The spots themselves are grayish-brown or chocolate, with a broad black border, and finely mottled internally (as is the ground color on the sides) with black. The blotches become narrower posteriorly; on the tail their confluence with the lateral series forms black half rings. On each side, and involving the second to the fifth rows, is another series of much smaller and nearly circular blotches, black with the centers brown. These alternate with the dorsal spots. Alternating with the series just described is still another similar to it, but entirely black, on the margin of the abdomen, and on the contiguous spots of the first, second, and third rows. These two lateral series are sometimes confluent. The anterior dorsal blotch is elongated, so as to cover the posterior half of the

vertical plate, and in it is a central elongated spot of the ground color behind the occipitals. A double light spot is seen on the junction of the occipitals. There is a dark band across the posterior half of the postfrontals, and another from the eye to the angle of the mouth. The labials are edged with black.

The abdomen is yellowish-white, with square black blotches, alternating with those already described.

The number and size of these spots varies somewhat in different specimens, though rarely less than forty from head to anus. The young differ in having the dorsal blotches bright chestnut-red inside of the black margins. The intervals are sometimes white or clear ash.

Cat. No.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
2342	7.	213 + 1.	46.	21.	800.	106.
9212	7.	180 + 1.	39.	21.	455.	65.
8975	7.	206 + 1.	49.	21.	299.	42.

Osceola doliata triangula Boie.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2342	1	Lebanon, Indiana	S. B. Davis	Alcoholic.
1663	1	Baltimore, Maryland	Dr. E. Cones, U. S. A.	do.
8975	1	Woods Hole, Massachusetts ..	Dr. T. H. Bean	do.
8989	1	.....	Department of Agriculture, Dr. L. N. Jaynes	do.
9212	1	.....	.....	do.
19856	.....	North America	W. H. Phillips .....	.....
17478	.....	Lafayette, Indiana	Frederick C. Test .....	.....
17955	.....	Milo, Bureau County, Illinois ..	O. P. Hay .....	.....
2314	1	Bedford, Long Island, New York ..	J. C. Brevoort	do.
2327	2	Lebanon Springs, New York .....	.....	do.
4858	1	Mount Joy, Pennsylvania ..	J. R. Townsend	do.
8016	1	Washington, District of Columbia ..	Dr. E. Cones, U. S. A.	do.
10083	1	Hughes, Ohio	R. T. Shepherd	do.

This subspecies, the common "milk snake," is abundant in the Middle States. It is very harmless in its manners, and useful in its habits. It lives on the small Mammalia, which are so injurious to the farmer. I once caught a specimen of this species which had captured a family of the *Arvicola riparia*, which it held in the following manner: One it had swallowed, one it was in the act of swallowing, and two others were securely held in two turns of the body so tightly as to render them incapable of biting their captor.

This form ranges farther north than any other representative of the genus. It is recorded by Professor A. E. Verrill as being common at Norway, Maine.

OSCEOLA DOLIATA COLLARIS Cope.

Ophibolus doliatus collaris COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 383.

Coronella doliata JAN, Icon. Gen. Ophid., Pt. 14, pl. IV, fig. A.

Saddle spots reddish, with black or dark brown borders, not extending below the second row of scales on each side. Alternative spots black, extending upward to the second row of scales, and embracing a

part of the gastrosteges. A median subquadrate black spot on the belly, opposite the dorsal spots. Top of head reddish, truncated behind by a transverse black border which crosses just posterior to the occipital plates, and is followed by the first interval of yellowish ground color. A yellowish band between eyes, which is continuous with a similar band which extends backward and downward, to the light half collar. It isolates below it a black band, which extends from the eye

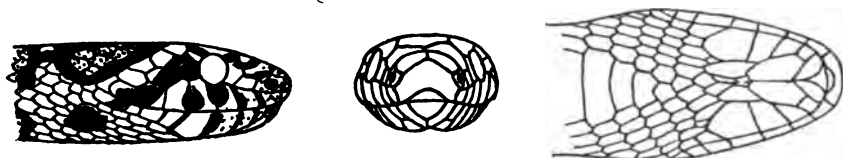


Fig. 211.

OSEOLA DOLIATA COLLARIS COPE.

= 1.

Elmira, New York.

Cat. No. 2433, U.S.N.M.

to the angle of the mouth, along the superior edge of the labial plates. Other labials yellowish, with black spots on the mutual sutures. A brown cross band on prefrontal plates.

Rostral plate not depressed or prominent. Loreal well developed; temporals 2-2-3. Postgenaeals half as long as pregenaeals. Scales rather wide and obtuse.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
5449.....	7.	192 + 1.	46.	21.	625.	92.
7849.....	7.	205 + 1.	45.	21.	478.	68.

This subspecies is intermediate between the *O. d. doliata* and the *O. d. clerica*, as may be learned from the analytical table. In its head coloration there is variation in the development of the interorbital light cross band. It is complete in Cat. Nos. 2433 and 5449 only; in Cat. Nos. 2192 and 7849 it is represented by large superciliary spots, and in Cat. No. 9745 by small ones. The yellow postocular band is not complete in Cat. No. 7849. In Cat. No. 2433 the yellow half collar is interrupted on each side by the slight contact of the dark borders of the head color and the first saddle spot, showing how the neckbands of the two subspecies *clerica* and *triangula* are formed.

Oseola doliata collaris Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
5449	1	Washington, District of Columbia.	.....	Alcoholic.
2433	1	Elmira, Illinois	Northwestern University ..	do.
7849	2	St. Louis, Missouri	Dr. G. Engelmann	do.
2192	1	Roanoke County, Virginia..	Chas. Shoemaker.....	do.
9745	1	Montgomery County, Maryland.	W. N. Steele.....	do.
9577	1	Washington, District of Columbia.	Wm. Talbert.....	do.
20644	1	Woodside, Maryland.....	J. E. Benedict.....	do.

Cat. No. 9745 presents the anomaly of only one temporal scale of the first row on each side. The head is narrower posteriorly than usual, and the colors are darker.

The specimens above enumerated are divided between the *O. d. doliata* and *O. d. triangulara* in Yarrow's Check-list.

OSCEOLA DOLIATA CLERICA Baird and Girard.

Ophibolus doliatus clericus COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 383.

Ophibolus clericus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, p. 88.

Coronella triangulum BOULENGER, part, Cat. Snakes Brit. Mus., II, 1894, p. 200.

General characters much as in *O. d. triangulara*. Top of head and nape with a longitudinal reddish black-edged spot which embraces a Y-shaped yellow spot in its center. A small median parietal spot. A pale cross band between orbits, and a brown band on the prefrontal plates, which continues as a black band from the eye to the angle of the mouth, crossing the last two superior labial plates. Labials with dusky mutual borders.

The body is crossed by a series of thirty-eight to forty-eight dorsal blotches, there being nine or ten on the tail. They are much broader

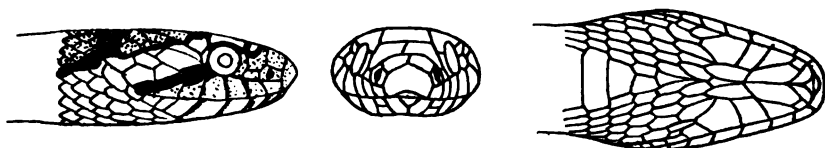


Fig. 212.

OSCEOLA DOLIATA CLERICA BAIRD AND GIRARD.

= 1.

Southern Illinois.

Museum, Academy of Natural Sciences, Philadelphia.

and larger than in *O. eximia*, and extend between the outer dorsal rows. These blotches are chocolate, lighter on the sides, and distinctly bordered with black; they are about five or six scales long. The intervals between the blotches are mottled ash, or pepper and salt. On each side is a second alternating series of black blotches, much smaller than the dorsal, and extending from the exterior dorsal row on the edge of the abdominal scutellæ. Beneath yellowish white, with distinct quadrate black blotches, opposite to the large dorsal spots, mostly divided on the middle line.

The body, viewed from above, appears encircled by a series of black rings in pairs, inclosing a third of an ash color. The tints, as usual, are darker on the back.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
2330.....	7.	215 + 1.	45.	21.	655.	82.
1407.....	7.	207 + 1.	46.	21.	598.	83.

In Cat. No. 8787 the ventral spots, which are opposite the dorsals, are undivided on the middle line as in the *O. d. collaris*.

Osceola doliata clerica Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2330	1	Somerville, North Carolina.	Dr. F. B. Hough.....	Alcoholic.
1407	1	? New York	Mus. Hist. Nat., Paris.....	do.
8787	1	Augusta, Georgia.....	Wm. Phillips.....	do.
2300	1	Mississippi.....	Dr. B. F. Shumard.....	do.

OSCEOLA DOLIATA TEMPORALIS Cope.

Ophibolus doliatus temporalis COPE, American Naturalist, XXVII, 1893, p. 1068, pl. xxv, fig. 4.

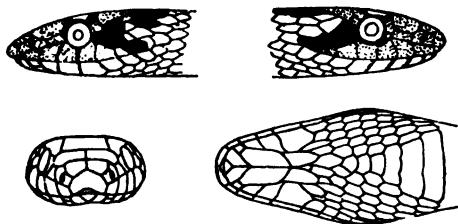


Fig. 213.

OSCEOLA DOLIATA TEMPORALIS COPE.

= 1.

Both sides of head.

Delaware.

Museum, Academy of Natural Sciences, Philadelphia.

OSCEOLA DOLIATA DOLIATA Linnaeus.

Ophibolus doliatus doliatus COPE, Check-list N. Amer. Batr. Rept., 1875, p. 37; Proc.

U. S. Nat. Mus., XI, 1888, p. 383.—COPE, Amer. Naturalist, XXVII, 1893, p. 1067.

Coluber doliatus LINNÆUS, Syst. Nat., I, 1766, p. 379.—HARLAN, Jour. Acad. Nat. Sci. Phila., 1827, p. 362.

Coronella doliata HOLBROOK, N. Amer. Herpet., III, 1842, p. 105, pl. 24.—DUMÉRIL and BIBRON, Erp. Gén., VII, p. 621.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 41.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 205.

Ophibolus doliatus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 89.

Head little distinct, muzzle not depressed or prominent. Rostral plate slightly visible from above; frontal widened forward. Temporals 2-2-3.

Dorsal saddle spots completed at sides, the border not encroaching on the gastrosteges, separated by yellow intervals. Intermediate spots large, dark, bordered partly on scales and partly on gastrosteges. Black spots or gastrosteges opposite dorsal saddles sometimes separate, sometimes united on the middle line. First yellow interval touching parietal plates. Head reddish above, bounded posteriorly by a transverse border. No postocular yellow stripe, sometimes a black postocular border to the red of the top of the head. Superciliary spots present, in five specimens confluent into a cross band. Prefrontal brown cross band present in the same four specimens. The number of

dorsal saddle spots varies from twenty-three (Cat. No. 6247) to twenty-eight (Cat. No. 10084).

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
6247.....	7.	187 + 1.	35.	21.	640.	72.
13916.....	7.	205 + 1.	43.	21.	790.	103.

This subspecies is intermediate in all respects between the *O. d. sypila* and the *O. d. collaris*. It is an elegant animal. Its geographical

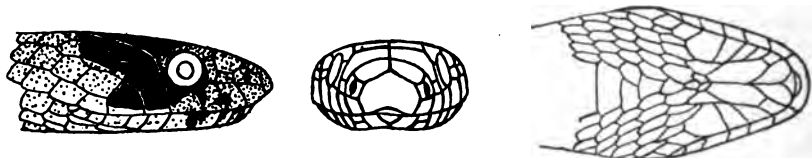


Fig. 214.

OSCEOLA DOLIATA DOLIATA LINNÆUS.

× 1.5.

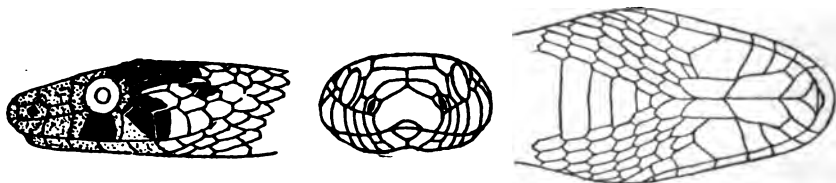


Fig. 215.

OSCEOLA DOLIATA DOLIATA LINNÆUS.

× 1.5.

Second specimen, showing variations.

range is throughout the southern middle latitudes of the Eastern region, extending from Iowa and Missouri through Illinois and Ohio to the Potomac River. Two specimens are from Texas (Cat. No. 1848).

Osceola doliata doliata Linnaeus.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
6247	2	Washington, District of Columbia.	A. Pourtales.....	Alcoholic.
1688	4	Southern Illinois.....	R. Kennicott.....	do.
1848	2	Brazos River, Texas.....	B. F. Shumard.....	do.
2344	2	St. Louis, Missouri.....	Dr. Geo. Engelmann.....	do.
7837	1	Washington, District of Columbia.	Dr. E. Coles, U. S. A.....	do.
8368	1	do.....	.....	do.
8015	1	do.....	Dr. E. Coles, U. S. A.....	do.
10084	1	Hughes, Ohio.....	R. T. Shepherd.....	do.
13916	1	.....	.....	.....
14836	.....	Cape Sable, Florida.....	Lieut. J. F. Moser.....	.....
15375	.....	New Orleans, Louisiana.....	Dr. R. W. Shufeldt.....	.....
15500	.....	Rock Creek Valley, District of Columbia.	Lester F. Ward.....	.....
16701	.....	St. Marys, Georgia.....	C. F. Batchelder.....	.....
17292-3	.....	Washington, District of Columbia.	C. W. Richmond.....	.....
20644	.....	Woodside, Maryland.....	J. E. Benedict.....	.....
19041	.....	Takoma Park, District of Columbia.	Dr. R. W. Shufeldt.....	.....
22319	.....	Rosalyn, Virginia.....	M. L. Linnell.....	.....

Cat. Nos. 6247 and 7837 are enumerated in Yarrow's Check-list, pages 90, 91, under *O. d. triangulus*.

OSCEOLA DOLIATA SYSPILA Cope.

Ophibolus doliatus syspilus COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 384.

Head small, flattened above, with the snout rounded; neck slightly contracted; body elongated, rather slender; scarlet above, and marked with black rings, in pairs; between each pair is a white ring.

The vertical plate is pentagonal, with an acute angle behind; the superior orbitals are oblong-quadrilateral, broadest behind, and not projecting over the eye; the occipitals are polygonal, and very large; the frontals are broad and pentagonal, narrowest externally, where they descend to join an elongate quadrilateral, loreal plate. The anterior frontals are also quadrilateral, smaller than the posterior, and broadest externally. The rostral plate is large, heptagonal, and concave below. There are two nasal plates, the posterior square, the anterior lunated behind for the nostril, which does not enter the posterior, but comes out at its anterior border. There is a single anterior orbital plate, oblong, slightly concave behind, and two small, subround, posterior orbitals. The inferior wall of the orbit is made up of the third and fourth superior labial plates, of which there are seven.

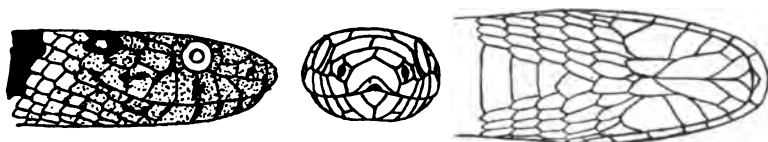


Fig. 216.

OSCEOLA DOLIATA SYSPILA COPE.

× 1.5.

The nostrils are lateral and near the snout. The eyes are small, the iris bright reddish gray. The neck is but slightly contracted, and is covered with small, smooth, subhexagonal scales. The body is long, tolerably stout, and covered above with scales similar to those of the neck, but larger. The tail is rather short, thick at its root, but soon becomes smaller, and terminates in a tip.

The anterior top of the head is crossed with a black band at the extremities of the occipitals, and the dark color may extend as far as the prefrontal plates, inclusive. The body is scarlet, banded with twenty-two pairs of jet-black rings, with a white ring between each pair of black. These rings do not completely surround the body, as in *Osceola elapsoides*, but the lower part of the anterior ring of one pair is continued within the margins of the gastrosteges, with the posterior ring of another pair, but always at a considerable distance on each side of the middle line.

The belly is marked with a single series of medium black spots, which are opposite the spaces between the dorsal saddles, or opposite the yellow rings. These spots represent the confluent lateral spots of the

O. d. doliata, *clerica*, etc., as shown in the analytical table of the subspecies. Their complete fusion with the black rings, and the obliteration of the lateral closing lines of the saddle spots would give us the *O. d. annulata*. The division of these median spots on the middle line, and their transposition to the sides, with the elevation of the lateral closing lines of the saddles to a point above the gastrosteges, would give us the *O. d. doliata*.

This subspecies is well sustained by sixteen specimens in the U. S. National Museum.

There are four partly distinct types of head coloration among these specimens. In Cat. Nos. 13008, 12925, 8345 the front is black to the end of the muzzle. In Cat. Nos. 1846, 2296, 4291 the end of the muzzle only is red. In Cat. Nos. 303 and 7850 the top of the head is reddish brown, and superciliary spots are present. In Cat. Nos. 13361, 13380, and an unnumbered specimen the top of the head is a uniform red or reddish gray; and in Cat. No. 21163 the upper surface is red, except the frontal plate and a broad band to the black collar, which are black. In this specimen there is no loreal plate on either side. There are only nineteen rows of scales, and the superior temporal of the first row is abnormally small. In these respects it approaches the *O. elapsoides*.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
4291	7.	210+1.	44.	21.	692.	95.
21163	7.	183+1.	44.	19.		
13380	7.	209+1.	48.	21.	762.	115.

Oscleola doliata sypila Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
4291	1	Republican River, Kansas..	Dr. W. A. Hammond, U. S. A.	Alcoholic.
4465	1	Appomattox County, Virginia.	.....	do.
1846	2	Fort Towson, Arkansas ..	Dr. L. A. Edwards, U. S. A.	do.
2296	1	Prairie Mer Rouge, Louisiana.	James Fairie	do.
13008	1	New Orleans, Louisiana ..	Dr. B. W. Shufeldt, U. S. A.	do.
12925	1	do	do	do.
13045	1	do	do	do.
12297	3	do	do	do.
8435	1	Apache, Arizona	H. W. Henshaw	do.
5188	1	Louisiana	J. W. Wallace	do.
303	1	Independence, Missouri ..	Dr. J. G. Cooper	do.
7850	1	Abbeville, South Carolina ..	.....	do.
13361	1	Wheatland, Indiana	Robert Ridgway	do.
13380	1	Richland, Illinois	do	Type.
21163	1	Raleigh, North Carolina ..	C. S. Brimley	Alcoholic.

Most of the specimens of this subspecies are enumerated in Yarrow's Check-list, under the head of *Ophibolus d. doliatus*.

OSCEOLA DOLIATA PARALLELA Cope.

Ophibolus doliatus parallelus COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 385.

Scales in twenty-one rows; rather short and wide. Head distinct, muzzle not prominent. Rostral plate very little visible from above, muzzle short. Frontal wide; occipital nearly as long as frontal and prefrontals. Loreal well developed, longer than high; oculars 1-2; temporals 2-2-3. The seven superior labials are all higher than long, the third and fourth bounding orbit. Postgenaeals half as long as pregenaeals.

Back crossed by saddles of brownish red (in alcohol) with black borders, which extend to the gastrosteges and there close by the longitudinal direction of the black border. These borders of opposite sides form



Fig. 217.

OSCEOLA DOLIATA PARALLELA COPE.

× 1.5.

Gainesville, Florida.

Cat. No. 10544, U.S.N.M.

parallel longitudinal black lines. The saddles are long, covering on an average nine scales. There are twenty of them in front of the anus in the type specimen. They are separated by yellow intervals of

one and a half scales in width. There are no lateral or ventral spots opposite to these alternating with the principal ones. The ground color below is yellowish. The top of the head is reddish brown bounded posteriorly by black, which crosses the posterior border of the occipital scuta. This is followed by a yellow half collar, which is followed by the black exterior border of the first dorsal saddle, and which turns backward along the ends of the gastrosteges like the others. A yellowish black-edged spot on each superciliary plate, and a similar one on the canthus rostralis, which sends a short branch along the anterior border of the prefrontal. Superior parts of superior labials black, inferior parts yellow.

Cat. No. 10544; upper labials, 7; gastrosteges, 210 + 1; urosteges, 46; scales, 21; total length, 325 mm; tail 42, mm.

This subspecies occupies an interesting intermediate position between *O. d. annulata* and *O. d. sypila*. It differs from the former in the non-fusion of the lateral saddle borders and the absence of a black collar; from the latter in the absence of intermediate spots on the middle of the belly and the close approximations of the borders of the saddles.

Osceola doliata parallela Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
10544	1	Gainesville, Florida	James Bell.....	Alcoholic.

OSCEOLA DOLIATA GENTILIS Baird and Girard.

Ophibolus doliatus gentilis COPE, Check-list N. Amer. Batr. Rept., 1875, p. 36;
Proc. U. S. Nat. Mus., XI, 1888, p. 383.

Ophibolus gentilis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 90;
Marcy's Report Expl. Red River, 1853, p. 229, pl. VIII.

Ground-color dull red, encircled by twenty-five pairs of black rings, the twenty-first opposite the anus, each pair inclosing a third ring of yellowish white. The black rings are conspicuously broader above, the three crossing eight scales on the vertebral row anteriorly, and toward the anus about five. Anteriorly the intervals between successive pairs consist of about five scales, posteriorly only of two or three, thus diminishing considerably. The black rings contract as they descend,

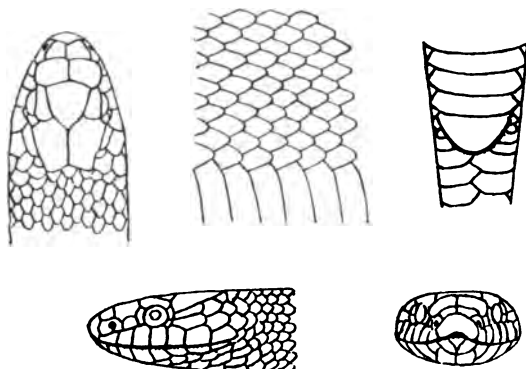


Fig. 218.

OSCEOLA DOLIATA GENTILIS BAIRD AND GIRARD.

Cat. No. 2337, U.S.N.M.

those of each pair receding slightly from each other, so as to cause the yellow portion to expand about one scale. The black rings are continuous on the abdomen, those of contiguous pairs (not of the same pair) sometimes with their intervening spaces black. The scales in the white rings are always more or less mottled with black, especially along the sides of the body, this mottling being very rarely observable

on the red portion. The anterior black ring of the first pair is extended so as to cover the whole head above, except the very tip; the yellow ring behind it involves the extreme tip of the occipitals. The black rings extend on the back so that the contiguous rings of adjacent pairs run into each other. There are twenty-eight pairs of rings, the twenty-fifth opposite the anus. The lateral borders of the saddle spots are fused into a single large median black spot on the abdomen, inclosing the extremities of the gastrosteges within the area of the dorsal saddle. The abdomen opposite the yellow interspaces is not spotted.

Cat. No. 1853; upper labials, 7; gastrosteges, 205 + 1; urosteges, 32 ♀ (injured); scales, 21; total length, 691 mm; tail, 61 mm.

The markings of this subspecies are quite as in the *O. d. annulata*, except that the black edges of the dorsal spots do not approach each other in that form. The scales are also narrower in the *O. d. gentilis*. The form is rare, as only one specimen is known to me.

Osceola dolliata gentilis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1853	1	Red River, Arkansas	Captain Marcy	Alcoholic.

OSCEOLA DOLIATA ANNULATA Kennicott.

Ophibolus doliatus annulatus COPE, Check-list N. Amer. Batr. Rept., 1875, p. 36;
Proc. U. S. Nat. Mus., 1888, p. 382.

Lampropeltis annulata KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 329.

Form stout, head broad, eye small. Scales broad. Color bright red with eighteen to twenty-two pairs of black rings from head to anus, each pair inclosing an immaculate yellow ring which completely encircles the body, widening but little upon the flanks. Abdomen between the yellow rings black. Top of head entirely black, this color extending posteriorly upon the occipitals in an acute angle. A broad occipital yellow ring.

General appearance similar to *O. d. gentilis*. The form is stouter, the head shorter, broader, and more depressed, and the eye smaller. The dorsal scales are different, being much broader; the lateral rows

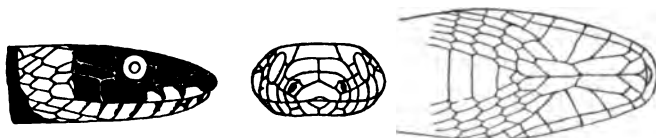


Fig. 219.

OSCEOLA DOLIATA ANNULATA KENNICOTT.

=1.

in *O. d. annulata* are higher than long, and those of the central are nearly as wide as long. In *O. d. gentilis*, those of the lateral rows are considerably longer than high, and those of the central nearly twice as long as wide. There are twenty pairs of black rings from head to vent, which do not diverge on the sides, each ring covering two to two and a half scales longitudinally on the vertebral region and narrowing but little laterally. The inclosed yellow rings are one and a half scales wide on the vertebral region. The first three pairs of black rings behind the head are, with those inclosed, a little wider. The intervals of red ground-color occupy four or five scales on the middle of the body, and one or two more anteriorly and posteriorly. The yellow rings are of nearly uniform width, and completely surround the body. The spaces between them on the abdomen are black. There are no black spots upon the body.

Cat. No. 1857; upper labials, 7; gastrosteges, 199 + 1; urosteges, 53; scales, 21; total length, 339 mm.; tail, 52 mm.

Osceola doliata annulata Kennicott.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1855	1	Brownsville, Texas		Alcoholic.
1841	1	do	Colonel Van Vliet	
1857	1	Matamoras, Mexico	Lieutenant Couch	
4293		San Antonio, Texas .....	.....	
7116	1	Cadereita, Nuevo Leon	Lieutenant Couch	
1845	1	Guanajuata, Mexico	A. Dugès	
12680	1	Cameron County, Texas	C. K. Worthen	
17031	1	.....	.....	
17032		.....	.....	

The variations presented by this series are instructive as showing the connections between these forms. In Cat. No. 7116 the abdominal black patches are divided by a pale longitudinal median line, which constitutes such a separation of the inferior borders of the saddle spots as characterizes the *O. d. parallela*. The head has the normal color. In Cat. No. 17031 these black patches are obsolete except as to the posterior four or five. It thus approaches the *O. d. conjuncta* Jan of Mexico, which it also resembles in head coloration. Cat. No. 17032, from the same locality, is colored typically.

The most northern locality from which I know this species is San Angelo, Texas, from which place I have received it from Mr. Otto Lerch.

The *O. doliata conjuncta*¹ is from Mexico generally, but it has not yet been found near the border.

The *O. d. polyzona*² is also very abundant in Mexico, especially in the Sierra Caliente. It ranges as far south as Panama. It is brilliantly colored, and reaches the full dimensions of the species.

OSCEOLA DOLIATA COCCINEA Schlegel.

Ophibolus doliatus coccineus COPE, Check-list N. Amer. Batr. Rept., 1875, p. 36; Proc. U. S. Nat. Mus., 1898, p. 382.

Coronella coccinea SCHLEGEL, Ess. Phys. Serp., II, 1837, p. 67, pl. II, fig. 11.

Ophibolus doliatus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 89.

Head rather more depressed than in the species of the other sections. The lower postocular, which is smaller than the upper, rests in a notch between the fourth and fifth upper labials, lying longitudinally against the latter. In many other species the contact is not so intimate.

Color in life, bright red. The body is encircled by twenty-four pairs of black rings (the nineteenth opposite the anus), each pair inclosing a yellow ring between them. Along the back the black and yellow rings are nearly of equal width, the three covering a length on the back of

¹*Ophibolus d. coccinea* Cope, Cat. Batr. Rept. Centr.-Amer. Mex., 1887, p. 78.

²*Lampropeltis polyzona* Cope, Proc. Acad. Nat. Sci. Phila., 1860, p. 258; Bull. U. S. Nat. Mus., 1887, p. 78. *L. micropholis* Cope, Proc. Acad. Nat. Sci. Phila., 1860, p. 257. *Coronella formosa* Schlegel, nomen nudum.

five or six scales. Anteriorly their intervals are eight or nine scales long, posteriorly somewhat less. The black rings, as they descend on the sides, separate somewhat, so as to leave an interval of about three scales; they are also somewhat narrower than above. On the abdomen they are generally interrupted, the corresponding ends of the same ring sometimes meeting and sometimes alternating. The posterior black ring of the first pair does not continue under the throat. The anterior black ring of the first pair crosses the posterior part of the occipitals, extending across between the angles of the mouth. The head in front of this is black, except the end of the muzzle and the adjacent labial plates, which are red. The narrow spaces between the black rings are dusted with black. The posterior edges of the labials are black.



Fig. 220.

OSCEOLA DOLLIATA OOCINEA SCHLEGEL.

× 1.5.

In a second smaller specimen from Mississippi there are seventeen pairs of rings to the anus, and four on the tail. The whole head is black, the first yellow interval beginning just back of the occipitals.

Cat. Nos.	Upper labials.	Gastrosteges.	Scales.	Urosteges.	Length. mm.	Tail. mm.
2305.....	7.	204.	21.	38.	432.	58.
5282.....	7.	189.	21.	52.	476.	73.

Fourteen specimens fall within the above definition of this subspecies. But some of these present slight anomalies. Thus Cat. No. 6069 has but one temporal on one side. Three other specimens are more peculiar. Cat. No. 2299 has the front reddish, with a small, yellow, brown-edged spot on the common suture of the parietals, which foreshadows the median spot or chevron of the *O. d. triangularis*. Of Cat. No. 2312, from northern Louisiana, one has but one temporal on one side, and the superior temporal very narrow in the other; and in both the face is red and the muzzle prominent and depressed, as in *Osceola elapsoides*. In one of them the loreal is wanting from both sides, while in the other it is present on both sides. These specimens are annectant to the species above named.

Osceola doliata coccinea Schlegel.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2298	1	Mississippi.	Dr. B. F. Shumard	Alcoholic.
2806	1	Galveston, Texas	Prof. E. B. Andrews	do.
2331	1	Calcasieu Pass, Louisiana	G. Wurdemann	do.
2337	1	Fort Union, New Mexico	Lieut. J. C. Ives, U. S. A.	do.
4292	1	Arkansas	Colonel Kearney	do.
4396	1	Fort Riley, Kansas	H. Brandt	do.
4760	1	New Orleans, Louisiana	New Orleans Academy of Sciences.	do.
4803	1	Columbus, Georgia	Dr. Lemer	do.
5560	1	Mississippi	Lieutenant Couch, U. S. A.	Type of <i>O. amarus</i> .
5282	1	Galveston, Texas	Prof. D. S. Jordan	Alcoholic.
6044	2	Pensacola, Florida	Dr. Jarvis, U. S. A.	do.
12804	1	Kemper County, Mississippi	D. C. Lloyd	do.
6089	2	Prairie Mer Rouge, Louisiana	James Fairlie	do.
2299	1	Louisiana	J. W. Wallace	do.
2312	1			
5188	1			

While this form graduates on the one side into the *Osceola elapsoides*, it approximates, on the other, nearly to the *O. d. conjuncta* Jan of Mexico on the other. In fact, it is principally distinguished from the latter by its inferior size.

OSCEOLA DOLIATA POLYZONA Cope.

Lampropeltis polyzona COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 258.

Ophibolus polyzonus SUMICHRIST, Bull. Soc. Zool. France, 1880, p. 181.

Ophibolus doliatus polyzonus COPE, Proc. U. S. Nat. Mus., 1888, p. 382; Amer. Nat., 1893, p. 1067.

Lampropeltis micropholis COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 257.

Coronella micropholis BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 203.

Coronella formosa JAN, Arch. Zool. Anat. Phys., II, 1863, p. 241; Icon. Gén. Ophid., Pt. 14, 1865, pl. IV, fig. B.—BOCOURT, Miss. Sci. Mex., Rept., 1886, p. 612, pl. XXXIX, fig. 3.

Coronella formosa var. *conjuncta* JAN, Arch. Zool. Anat. Phys., II, 1863, p. 242, fig. C.—BOCOURT, Miss. Sci. Mex., Rept., 1886, p. 611, fig. 6.

Coronella doliata var. *formosa* BOULENGER, Bull. Soc. Zool. France, 1880, p. 44.

Coronella formosa vars. *anomala*, *oligozona*, *polyzona*, *abnorma*, etc., BOCOURT, Miss. Sci. Mex., Rept., 1886, p. 612, figs. 4, 7, 8.

Ophibolus triangulus var. *zonatus* GARMAN, N. Amer. Rept., 1883, p. 67.

Coronella annulata GÜNTHER, Biol. Centr.-Amer., Rept., 1893, p. 109. pl. XXXVIII.

Scales in twenty-one or twenty-three longitudinal rows, rather wide and obtuse. Head little distinct. Plates of the head much as in *O. d. doliata*, the superciliaries narrow and the frontal wide, and the longitudinal line of suture of the occipitals only three-fourths of the length of the latter plate. The outer borders of the occipitals present two posterior divaricating angles, and one on each side at the end of the first temporal. Upper labials seven, third and fourth entering the orbit; inferior labials nine, the seventh twice as large as the last two together. Loreal rather small; temporals, 2-2-3. Gastrosteges, two hundred and nineteen; one entire anal; urosteges, forty-three pairs.

Measurements.—Total length, 423 mm.; tail, 50 mm.

The color is a delicate red with a black tip upon each scale. The

body is completely encircled by ten or more pairs of jet-black rings, which vary in the degree of their distinctness, and are continued across the belly. The space included in each pair is three or four scales wide, and is red, each scale having a black tip. The tail is ornamented with two pairs of black rings and a black tip. Anterior to the first pair of rings a black collar four scales wide encircles the neck, scarcely touching the tips of the occipitals; the superciliary frontal, except its anterior border, and the occipitals within a line drawn diagonally from the posterior termination of their suture to the lower postocular, are black. A spot below the eye, one on the chin, the end of the muzzle, and the posterior borders of most of the other plates of the head are black. The spaces inclosed between the black spaces, which cross the parietal and internasal plates, are yellow.

This brilliantly colored subspecies varies very much in the development and relations of the black rings. Several of the forms are beautifully figured by both Bocourt and Günther, as above cited. Boulenger gives the following variations as having come under his observation:¹

- A. Annuli separated by broad red interspaces; red scales not tipped with black.
- B. Annuli separated by broad red interspaces, the scales of which are tipped with black.
- C. Black rings, irregular; belly black.
- D. Black with yellow rings, the red color appearing on each side as rounded spots.
- E. Red above, each scale tipped with black, the rings reduced to mere traces here and there.
- F. Almost uniform black, with very indistinct traces of light annuli.

The presence of twenty-three rows of scales is not uncommon.

This subspecies belongs to the Central American subregion of Neotropicalia, and I have not seen it from the plateau, but described it from three specimens from Jalapa in the Tierra Templada, in the museum of the Philadelphia Academy. Dugès, however, records it from Guanajuato, and Boulenger mentions specimens from the City of Mexico and from Amula, Guerrero, so that it must be introduced here. Boulenger's A and B are the most common varieties, B more so than A.

Osceola dolata polyzona Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
Var. A.				
1347	1	Colima, Mexico	John Xantus	Alcoholic.
1367	2	do	do	do.
1960	4	Guatemala	H. Hague	do.
Var. B.				
8944	5	Mirador, Vera Cruz	D. C. Sartorius	do.
	1	Peten, Guatemala	Dr. H. Bevendt	do.
	1	Tuxpan, Vera Cruz	G. Lincoecum	do.
	1	Mexico	F. Sumichrast	do.
	1	?	?	do.

¹ Cat. Snakes Brit. Mus., II, 1894, p. 204.

At the same date I described this subspecies under two names, *Ophibolus micropholis* and *O. polyzonus*. On finding them to be identical I selected for the form the name "*polyzonus*," although it appeared on the page following the one on which "*micropholis*" was printed. The name "*polyzonus*" has been repeatedly used since, while the name "*micropholis*" has been allowed to disappear. Dr. Boulenger, however, in his Catalogue of Snakes in the British Museum, revives the latter name without explanation, but probably because it appeared one page earlier than the name "*polyzonus*." I think this course unjustifiable and calculated to produce confusion. It is generally understood that of two names simultaneously published, an author has the right to select whichever one he chooses when the two apply to the same thing. Moreover, Boulenger regards it as a full species, whereas formerly he agreed with me that it can only be maintained as a subspecies of the *Osceola doliata*. If one examines the analytical table or compares the diagnoses of this and the allied forms in the Catalogue of the British Museum he will not find any characters given to substantiate this change of view, but rather evidence that the first opinion of Dr. Boulenger was the correct one.

Sumichrast in his manuscript notes, says of this subspecies:

Among the numerous Mexican snakes which are called "coralillas," this one attains the largest dimensions. It is distributed throughout the warm and temperate regions, but disappears in the alpine region, where, at least, I have never observed it. This snake prefers shaded localities, as plains covered with tall herbs and along rivers. Although of a very harmless disposition, it is not easily caught, since on being alarmed it glides swiftly through the vegetation and is not long in disappearing in the gallery excavated by some other animal. It also lives in the enormous nests of the ant *Oroodoma mexicana*, on which it warms itself in the sun. Although entirely inoffensive, it does not escape the charge of being poisonous, as all the coralillas are supposed to be by the natives.

OSCEOLA ELAPSOIDEA Holbrook.

Osceola elapsoidea BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 133.—COPE, Proc. Amer. Phil. Soc., 1877, p. 65; Bull. U. S. Nat. Mus., No. 1, 1875. *Calamaria elapsoidea* HOLBROOK, N. Amer. Herp., III, 1842, p. 119, pl. xxviii. *Coronella doliata* BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 205.

Snout projecting over the lower jaw; mouth deeply cleft. Vertical plate hexagonal, longer than broad anteriorly. Occipitals large, elongated, and angular. Postfrontals very large, extending to the second upper labial. Prefrontals proportionately well developed and trapezoidal. Rostral very broad. Nostrils very large, occupying the whole inner margin of the nasals, and visible from above. Anteorbital narrow, resting on the third labial. Middle of the eye over the commissure of the third and fourth labial. Two angular postorbitals, inferior one situated on the commissure between the fourth and fifth labials. One large temporal shield, anterior, several posterior ones smaller. Upper labials seven, sixth largest; inferior labials seven, fifth largest.

Body subcylindrical, deeper than broad; tail forming about the eighth of the total length. Scales rhomboidal, perfectly smooth, constituting nineteen rows; the outer row slightly broader than the rest.

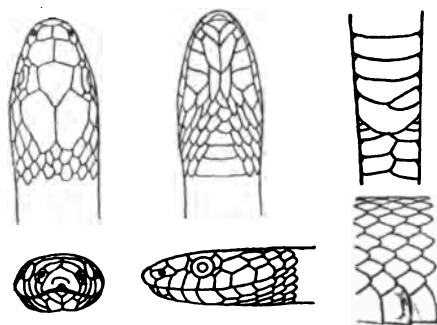


Fig. 221.

OSCEOLA ELAPSOIDEA HOLBROOK.

× 1.5.

Florida.

Ground color brilliant red above, fading below, annulated with fifteen pairs of jet-black rings from head to anus, and three pairs on the tail, each pair inclosing a white ring. Head from the eyes to the snout red, vertical plate maculated with black. A black bar across the occipitals to the temporal shields, and another on the neck, between which is a yellowish ring, narrow above, and spreading over the angle of the mouth, posterior upper labials, and inferior surface of the head. The black rings

cover from two to three scales, and the intermediate white, one scale. The red spaces between the black embrace from four to seven scales. The black rings taper toward the sides, while the white ones are spreading.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
2384.....	7.	175 + 1.	44.	19.	432.	67.
9689.....	7.	175 + 1.	39.	19.	449.	69.
2305.....	7.	171 + 1.	39.	19.	404.	59.

Osceola elapsoides Holbrook.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2305	1	Enterprise, Florida.....	Dr. Wheeler.....	Alcoholic.
2384	1	Charleston, South Carolina.	Dr. S. B. Barker.....	do.
5560	1	Columbus, Georgia.....	Dr. Semer.....	do.
7851	1	Apalachicola, Florida.....	O. B. Seagrave.....	do.
9689	1	Arlington, Florida.....	G. B. Goode.....	do.
11988	1	Georgiana, Florida.....	Wm. Wittfield.....	do.
16700	1	Fernandina, Florida.....	C. F. Batchelder.....	do.
17924	1	Florida.....	Dr. E. M. Hale.....	do.
13644	1	Georgiana, Florida.....	Wm. Wittfield.....	do.
17391	1	Lake George, Florida.....	C. W. Richmond.....	do.
10743	1	Milton, Florida.....	S. T. Walker.....	do.
20137	1	Gainesville, Florida.....	J. Bell.....	do.
18030	1	Indian River, Miko, Florida	Dr. Geo. Marx.....	do.
22322	1	Winter Haven, Florida.....	Guy E. Mitchell.....	do.

The relations of this species to the *O. doliata coccinea* are interesting. The characters of typical examples of the two are clear enough, but in one specimen and another they all fail. Florida specimens are generally true to those of *O. elapsoides*, but in the other Gulf States exceptions occur. Thus, Cat. No. 5560 (Columbus, Georgia), is a *coccinea* with

only nineteen rows of scales. In Cat. Nos. 10743, 9689, 20137, otherwise true *elapsoidea*, a loreal plate is present. In Cat. No. 17924 otherwise a true *elapsoidea*, the first row of temporals consists of two scales, the upper well developed on one side and rudimental on the other. In the following specimens there are only seventeen rows of scales: Cat. Nos. 2305, 11988, 13644, 17391, 18030, all from Florida. These are all *elapsoidea* in scutal characters except Cat. No. 11988, which has a loreal on one side. I have in my private collection a specimen with one loreal. The rostral plate is more prominent in the *O. elapsoidea* than in the *O. d. coccinea*.

I suspect that this species has been derived from the *O. d. coccinea* by a process of reduction of scale formulæ, accompanying reduction in size. The transitional stages have been in fact discovered, as above pointed out, in a few individuals, which are much less numerous than those of the two types.

OPHIBOLUS Baird and Girard.

Ophibolus BAIRD and GIRARD, Cat. Rept. N. Amer., Pt. 1, Serpents, 1853, p. 82.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 36; Proc. Amer. Phil. Soc., 1886, p. 487; Bull. U. S. Nat. Mus., No. 32, 1887, p. 78.

Lampropeltis FITZINGER, Systema Reptilium, 1843, p. 25, *nomen nudum*.—COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 254.

Bellophis LOCKINGTON, Proc. Cal. Acad. Sci., 1877, p. 52.

Posterior maxillary teeth larger and stronger than the anterior. Head but little distinct. Cephalic scuta normal. Rostral plate not modified; loreal present; one preocular. Scales smooth, with two apical pits. Anal scutum entire; subcaudal scuta in two rows. Pupil round. Hemipenis with very few calyces and many spines; former apical, not fringed.

This genus represents in North America the *Coronella* of the Old World, but is abundantly distinct in its entire anal scutum, its double scale pits, and the reduced number of its penial calyces. Its six species form a very homogeneous group, and although they present abundant differences to the eye, critical examination shows that their characters are by no means easy to determine. Some of them (*O. getulus*) offer a degree of variation within themselves which is not equaled by any other North American species with the exception of the *Eutaenia sirialis*. They afford excellent lessons in the evolution of specific types.

The subtraction of the former *O. doliatus* and its reference to the *Osceola*, leaves *Ophibolus* exclusively Nearctic in distribution, and it is found in every part of the realm except the extreme Northwest and the Canadian district.

The species differ as follows:

Temporal scuta, 2-3-4.

α. Scales in 21-3 rows.

Eight superior labials; numerous brown dorsal saddle spots closed at the sides..... *O. multistratus*.

- Seven superior labials; head wide, distinct; body slender; numerous black rings more or less split with red..... *O. pyrrhomelas*.
 Seven labials; large, robust, head little distinct; black, with or without transverse or longitudinal bands..... *O. getulus*.
 Seven labials; robust, head not distinct; light brown with small transverse reddish dorsal spots faintly dark bordered *O. rhombomaculatus*.
αα. Scales in 25 rows.

Seven labials; robust; light brown with a median dorsal, and two lateral rows of dark brown spots faintly dark bordered..... *O. calligaster*.

The distribution of these species is as follows: The *O. getulus* has nearly the same Eastern range, not reaching so far north by 10°, and covers the Sonoran and Pacific regions besides, but is scarcely found in continental Mexico. The *O. pyrrhomelas* inhabits the Sonoran and southern part of the Pacific regions. The *O. rhombomaculatus* occupies the middle regions east of the Appalachian Mountains, and the *O. calligaster* the corresponding region west of those mountains, and extends west as far as the Pecos River of Texas.

OPHIBOLUS RHOMBOMACULATUS Holbrook.

Ophibolus rhombomaculatus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 86.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 37.

Coronella rhombomaculata HOLBROOK, N. Amer. Herpt., III, 1842, p. 103, pl. xxiii.

Lampropeltis rhombomaculata COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 255.

Coronella calligaster BOULENGER, part, Cat. Snakes Brit. Mus., II, 1894, p. 198.

Above, light chestnut-brown, darker along the back, lighter toward the abdomen. Each scale minutely mottled with darker. Beneath light reddish-yellow, obscurely blotched with light brown. A series of

fifty-two to sixty transverse dorsal blotches from head to tip of tail; about a dozen of them on the tail. These are irregularly and transversely rhomboidal, six or seven scales wide, one and a half to two and a half long, and separated by intervals of about three scales, thus wider than the blotches. Their color is darker chestnut, with very narrow, often

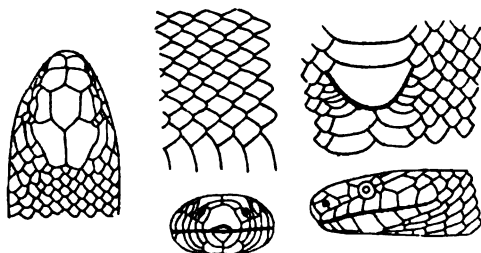


Fig. 222.

OPHIBOLUS RHOMBOMACULATUS HOLBROOK.

—1.

imperfect, darker margins, and sometimes with a faint areola lighter than the ground color. On each side and alternating with this series is a second on the second to the sixth outer rows, and about a scale long; then a third again, alternating on the first, second, and third rows, sometimes involving the edges of the scutellæ. These, though smaller than the dorsal spots, are similar. They are sometimes confluent with each other, though rarely with those of the back. There is sometimes a faint stripe from the eye to the angle of the mouth, but this is frequently wanting. A short wide longitudinal band like the

dorsal spots on each side the nape, embracing in some specimens a similar longitudinal spot on the parietal scuta.

The head is very little distinct from the body, and the muzzle is obtuse, with the rostral plate four-fifths as high as wide. The loreal plate is small, and generally more nearly square than in *Osceola doliata*. The eye is small, and the inferior of the two postoculars is longer than deep. Temporals 2-3-4. The superior labials are deeper than long, except the first and the last. The scales of the body are in twenty-one rows. They are rather wide and graduated in dimensions, the increase in size of the first and second rows not being abrupt.

Cat. Nos.	Upper labials.	Gastroteges.	Urostege.	Scales.	Length.	Tail.
2357.....	7.	203.	48.	21.	698.	98.
13613.....	7.	205.	43.	21.	747.	95.

This species was for a long time rare in our museums, but recently a good many specimens have been taken, especially from the neighborhood of Washington, District of Columbia. Its range is from Georgia to the Potomac River, so far as known. Two, and probably three, specimens have been recently taken on the Virginia side of that river; one near Alexandria, and one near Munson's Hill by Dr. A. K. Fisher. Dr. Fisher showed me his specimens, which belongs to the Museum of the United States Department of Agriculture, in a fresh state. It did not exhibit the bright salmon red of the belly described and figured by Holbrook, but was of a cream color with large pale reddish spots.

The affinities of this species to the *Osceola doliata* are not close, on account of the wide difference in penial characters. The color pattern and shades are quite different, but apart from this the external distinctive features are few. The uniform presence of three temporals in the second row is contrasted with the usual occurrence of but two in the *O. doliata*. The penial structure allies it to the *Ophibolus calligaster* and is widely different from that of the *Osceola doliata*.

Ophibolus rhombomaculatus Holbrook.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2385	1	Anderson, South Carolina	Miss C. Paine	Alcoholic type.
2358	1	Jackson, North Carolina	Fitzgerald	Alcoholic.
2357	1	Georgia	C. B. Adams	do.
13613	1	Alexandria, Virginia	Geo. Shoemaker	do.
10219	1	Statesville, North Carolina	A. L. Barringer	do.
15242	1	District of Columbia	H. W. Henshaw	do.
15329	1	Roslyn, Virginia	L. Stejneger	do.
16294	1	Brookland, District of Columbia.	Fred. Holter	do.
16405	1	do	f.	do.
17444	1	Dunn Loring, Virginia	C. W. Richmond	do.
20476	1	Woodside, Maryland	J. E. Benedict	do.
16380	1	Brookland, District of Columbia.	W. B. Barnes	do.
16832	1	do	P. Ridgway	do.
20480	1	Raleigh, North Carolina	C. S. Brimley	do.
16496	1	Falls Church, Virginia	H. W. Henshaw	do.
17294	1	Bladensburg, Maryland	C. W. Richmond	do.
17637	1	Linden, Maryland	N. P. Scudder	do.
22508	1	Kensington, Maryland	J. D. Higgins	do.

This species is quite constant in its characters, but a few variations occur. Thus there is but one temporal of the first row, and the loreal is fused with the postnasal on both sides in Cat. No. 15329. In Cat. No. 16294 there are twenty-three rows of scales. Cat. No. 17444, a young individual, presents many anomalies. There is but one nasal plate on both sides, and on one side there is a second loreal above the normal one. The first and second superior labials are fused on one side, and all the superior labials posterior to the fourth on both sides. The inferior temporals of two rows are fused on one side, and there is but one above it in the second row, so that the formula is 2-2. Other specimens of the same size are entirely normal.

OPHIBOLUS CALLIGASTER Say.

Ophibolus calligaster COPE, Check-list N. Amer. Batr. Rept., 1875, p. 37; Proc.

U. S. Nat. Mus., 1892, p. 610.—H. GARMAN, Bull. Illinois Lab., III, 1892, p. 293.

Coluber calligaster SAY, Harlan's Med. and Phys. Res., 1835, p. 122; Journ. Acad.

Nat. Sci. Phila., V, 1827, p. 359.

Coluber guttatus SCHLEGEL, Ess. Phys. Serp., II, 1837, p. 168; not of Linnæus.

Ablates triangulum var *calligaster* HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1856, p. 244.

Ophibolus evansi KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1859, p. 99.

Lampropeltis calligaster COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 255.

Coronella eransi JAN, Arch. Zool. Anat. Phys., II, 1863, p. 243, fig. 3; Icon. Gén.

Ophid., 1866. Pt. 17, pl. II, fig. 3.

Coronella tigrina JAN, Arch. Zool. Anat. Phys., II, p. 244.

Coronella calligaster BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 198.

Ophibolus triangulus vars. *calligaster* and *rhombomaculatus* GARMAN, N. Amer. Rept., 1883, pp. 66, 156.

Head rather elongate, little distinct, rather flat. Rostral plate little prominent; frontal wide anteriorly, narrowed posteriorly; parietals short, equaling frontal plate. Loreal longer than high; oculars 1-2, the post oculars equal. Temporals, 2-3-3. Superior labials seven, not much elevated, higher than long except first and seventh. Eye over third and fourth. Inferior labials nine, fifth largest. Postgenaeals not quite as long as pregenaeals.

Scales rather wide, in twenty-five longitudinal rows; the first a little larger than the others. Tail short.

Light olivaceous-brown or gray, with a dorsal series of about sixty subquadrangular, emarginate, dark chestnut-brown blotches from head to tip of tail, and two smaller lateral series on each side. The dorsal spots cover ten rows of scales transversely, and three longitudinally on the anterior part of the body, and two on the posterior part. Their anterior and posterior borders are more or less concave. Their border is very narrowly darker colored with interruptions, and the ground color is lighter next to them. The first row of lateral spots does not reach the gastrosteges, and covers three to four scales vertically and two scales anteroposteriorly. They alternate with the dorsals. The inferior row alternates with those last described, and the spots are

smaller, covering a scale of the inferior row and part of the end of the adjacent gastrosteges. The belly is light yellowish, tessellated with square brown spots of various sizes. These become obscure in large

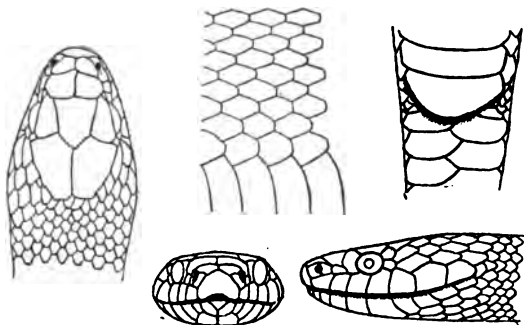


Fig. 223.

OPHIBOLUS CALLIGASTER SAY.

= 1.

St. Louis, Missouri.

Cat. No. 1629, U.S.N.M.

and old specimens. Two parallel brown bars on the nape diverge as they reach the parietal plates, and receive between them the apex of a lenticular brown spot which extends forward to the middle of the frontal. A cross band of brown occupies the posterior half of the prefrontal plates. A brown band from the eye to the angle of the mouth crosses the superior parts of the last three superior labials.

In large and old specimens these head markings become obsolete. In specimens where the median frontoparietal spot is distinct, it embraces a narrow median spot of the ground color.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
593.....	7.	202.	42.	25.	874.	112.
1629.....	7.	230.	54.	25.	988.	145.

This handsome species ranges the Mississippi Valley, at no great distance on either side of the river, from Wisconsin to Texas, and it extends throughout northern Texas almost to the Pecos. It was originally described by Say, but remained unknown to other American naturalists until its rediscovery by Kennicott thirty-five years later.

Ophibolus calligaster Say.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1702	1	Canadian River, Arkansas.	.....	H. B. Mollhausen.....	Alcoholic.
1629	1	St. Louis, Missouri.....	.....	Dr. Geo. Englemann.....	do.
1721	1	North of Colorado River, Texas.	.....	Capt. John Pope, U. S. A.	do.
5229	1	Neosha Falls, Kansas.....	.....	B. F. Goss.....	do.
4289	1	Southern Illinois.....	.....	Dr. Hunter.....	do.
12019	1	Mount Carmel, Illinois.....	Nov. —, 1881	L. M. Turner.....	do.
593	1	Central Illinois.....	.....	R. Kennicott.....	do.
10626	1	Fort Davis, Texas.....	.....	W. F. von Manteufel.....	do.
13832	2	Olney, Illinois.....	.....	? Walker.....	do.
14097	1	Cook County, Texas.....	.....	G. Ragadale.....	do.
21486	1	Waco, Texas.....	.....	C. Brimley.....	do.

OPHIBOLUS PYRRHOMELAS Cope.

Ophibolus pyromelanus COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 305; Check-list N. Amer. Batr. Rept., 1875, p. 37 (*pyrrhomelas*); Rept. U. S. Geograph. Surv. W. of 100th Mer., V, 1875, p. 537, pl. XIX.—COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 610.

Bellophis zonatus LOCKINGTON, Proc. Cal. Acad. Sci., 1877, p. 52.

Scales in twenty-three longitudinal rows; tail five and one-half times in total length. Fifty to fifty-eight black annuli on an ochraceous white ground on the body; each anteriorly completely, posteriorly more or less incompletely, split by a vermilion annulus, all extending with irregularities on the belly.

Head quite distinct from body; muzzle contracted. Frontal plate broad, with prolonged apex; parietals elongate, emarginate behind; equal in length to the frontal and half the prefrontal. Temporals 2-3-4 on one or both sides. Postgenaeals half the length of the pregenaeals. Dorsal scales rather broad, outer series not abruptly enlarged.

In one specimen all the

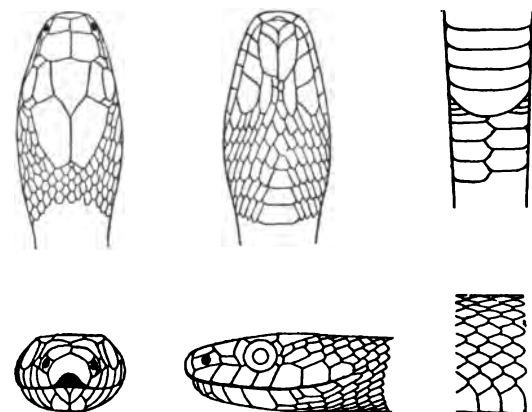


Fig. 224.

OPHIBOLUS PYRRHOMELAS COPE.

× 1.3.

Prescott, Arizona.

Cat. No. 15402, U.S.N.M.

black annuli to the middle of the tail are divided by the red, thus leaving the black as a margin to it; hence the number of these annuli is fewer. They are four scales wide behind the middle of the body. In another specimen only four anterior rings are completely divided, those on the following third of the length being divided by red on the sides; the remaining annuli black, three scales wide; white annuli one and one-half scales; anterior, or nuchal, red annulus widest, its anterior black margin attaining parietals; an ochraceous band from gular region, not quite completed across parietals. Muzzle, prefrontal plates, and labial margin ochraceous; remainder of top and sides of head black.

Measurements.—Total length, 762 mm.

This species has a longer body than the known red-ringed species, and is, indeed, most closely related to the *O. boylii*. It will always be distinguished from the latter by the much more numerous annuli (twenty-eight in *boylii*).

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
8174.....	7.	224 + 1.	66.	23.	645.	111.
7845.....	7.	218 + 1.	68.	23.	638.	109.
11753.....	7.	218 + 1.	52.	23.	725.	102.

This species occupies a position between the *Osceola doliata* and *Ophibolus getulus boylii*. It is, in fact, an *Ophibolus getulus boylii* of slender form and reduced size, in which the black spaces between the white rings are more or less split by red. This division, when complete, gives the snake the appearance of the *Osceola doliata occipitalis*, and, to a somewhat less degree, of the *O. d. coccinea*. Such are specimens Cat. Nos. 8174, 4292, 10200. When the black is complete just at the middle line of the back, we have a form like *O. d. gentilis*, as Cat. No. 8435. In Cat. Nos. 7845, 11753, 13571 the red only appears on the anterior part of the body, and divides completely only a limited number of black rings behind the head. These approach nearest the *Ophibolus g. boylii*. The species further varies in the extent to which the black of the front covers the muzzle. The latter is white to the posterior part of the pre-frontal scuta in Cat. Nos. 7845, 8174, 10200; it is speckled at the end and on the sides in Cat. Nos. 8435, 4292, and it is totally black in Cat. Nos. 11753, 13571. The yellow half collar crosses the posterior parts of the parietal plates in this species, advancing farther forward than in any of the subspecies of *Osceola doliata* excepting the *O. d. occipitalis*.

The increased number of scales on the body and on the temporal region indicate that the affinities of this species are stronger with the *Ophibolus boylii* than with the *Osceola doliata*. It inhabits a hotter and a dryer region than the *O. boylii*, and as the conditions of the country are of later geologic origin than are those of California, the habitat of the *O. boylii*, we may conclude that it is a descendant of the latter. It appears in the dry southern part of California. It illustrates how, under a semitropical sun, a brilliant color makes its appearance little by little, and probably in a way totally different from that in which it appeared in the case of the *Osceola doliata coccinea*. (See that species.)

Ophibolus pyrrhomelas Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
7845	1	Fort Whipple, Arizona	.....	E. Palmer	Alcoholic.
8174	1	Arizona	.....	Exp. W. of 100 M.	do.
10200	1	White River Canyon, Arizona.	.....	Dr. R. T. Burr	do.
11421	1	Fort Whipple, Arizona	— —, 1805	Dr. E. Cope, U. S. A.	Alcoholic type.
8435	1	Apache, Arizona	.....	H. W. Henshaw	Alcoholic.
4292	1	Fort Union, New Mexico	.....	Möhlhausen	.....
13571	1	Yosemite, California	.....	J. M. Hutchings	Alcoholic.
13889	1	San Diego, California	.....	C. R. Orcutt	do.
15402	1	Prescott, Arizona	.....	Dr. W. L. Carpenter	do.
15702	1	do	.....	Capt. W. L. Carpenter	do.
22375	1	Mesilla Valley, New Mexico.	.....	T. D. A. Cockerell	do.
22195	1	Fort Huachuca, Arizona	.....	Fisher	do.

The specimen of this species described by Lockington as *Bellophis zonatus* is said to have been brought from northern California. I have examined it and do not find it to differ from those of this species.

OPHIBOLUS MULTISTRATUS Kennicott.

Ophibolus multistratus COPE, Check-list N. Amer. Batr. Rept., 1875, p. 37.

Lampropeltis multistrata KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 328.

Dorsal scales in twenty-three rows. Form similar to that of *Osceola gentilis*, but the head and eye larger. Color above brownish red, with thirty-one pairs of narrow black half rings inclosing white spaces from head to anus, the black rings not extending across the abdomen, which is uniform yellowish white. Head black above.

Snout broader and more depressed than in *Osceola gentilis*. It is also more elongate, and hence, also, the loreal and nasal plates; in the only specimen examined, the second superior labial plate is replaced by two smaller ones, thus increasing the number to eight, a peculiarity probably abnormal, as all the other species of the genus have seven. The body above is brownish red in spirits, crossed by thirty-one pairs of black rings from head to anus. The inclosed white spaces are one and a half scales wide on the central fifteen dorsal rows, and begin to widen abruptly on the fourth lateral row on each side, extending over three or four scales longitudinally on the first row. On the sides they are punctulated with black, as in *Osceola gentilis*. The occipital white ring is much broader.

The black rings are each two scales wide on the vertebral region, narrowing to less than one scale laterally. On the fourth lateral row the two rings of each pair begin to diverge, the anterior uniting on the edge of the abdomen with the posterior ring of the pair in advance, the posterior becoming confluent with the anterior of the succeeding pair. Thus the ground color is inclosed in the form of a transverse elliptical spot. Upon the middle of the body these spots are two or three scales wide on the vertebral region, four or five on the sides, and but one on the first row of scales. Anteriorly the red intervals are greater; posteriorly they narrow slightly, but toward the tip of the tail they are entirely lost, as in *Osceola doliata* and *gentilis*, by the confluence of the black rings. The black rings extend but a short distance upon the abdominal scuta, leaving the abdomen destitute of blotches, though it is faintly and sparsely punctulated. The chin and inferior labials are tinged with brown. The top of the head is black, as in *Osceola gentilis*.

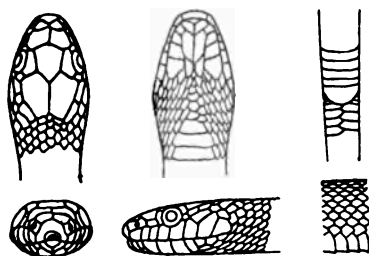


Fig. 225.

OPHIBOLUS MULTISTRATUS KENNICOTT.

× 1.3.

Fort Niobrara, Nebraska.

Cat. No. 14108, U.S.N.M.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
1842	8.	208.	49.	23.	305.	40.
16108.....	7.	198.	46.	23.		

The number of rows of body and temporal scales and the more numerous rings will distinguish this species from *Osceola doliata*, and those above compared with it. From the *Ophibolus pyrrhomelas* it differs in the eight superior labial plates.

Ophibolus multistratus Kennicott.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1842	1	Fort Lookout.....	Dr. Hayden.....	Alcoholic.
16108	1	Fort Niobrara, Nebraska.	Dr. Wilcox, U. S. A.....	do.

OPHIBOLUS GETULUS Linnaeus.

Ophibolus getulus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 85.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 37.

Coluber getulus LINNÆUS, Syst. Nat., I, 1766, p. 382.—GMELIN, Linnaeus Syst. Nat., 13th ed., I, Pt. 3, 1788, p. 1106.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 358.—PEALE, Contr. Macrur. Lyc., I, 1829, pl. v.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 249.

Pseudoeclaps getulus FITZINGER, Neue Class. Rept., 1826, p. 56.

Herpetodryas getulus SCHLEGEL, Ess. Phys. Serp., II, 1837, p. 198.

Coronella getula HOLBROOK, N. Amer. Herp., III, 1842, p. 95, pl. 21.—DUMÉRIL and BIBRON, Erp. Gén., VII, p. 617.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 197.

Lampropeltis getulus COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 255.

Head little distinct, conical, not depressed, the muzzle slightly compressed and the rostral plate projecting beyond the lower jaw. Rostral plate moderately recurved on the superior face of the muzzle. Frontal rather wide, produced posteriorly. Loreal small; oculars 1-2. The eye not large, resting on the third and fourth superior labials. Temporal scales 2-3-4. Superior labials seem higher than long, except the first, sixth, and seventh. Inferior labials ten, fifth largest; postgenaeals shorter than pregenaeals. Scales in from twenty-one to twenty-five rows, rather short, the sizes graduating insensibly. Tail short.

Ground color black, marked above and below with yellow or white spots and bands, the latter generally transverse, rarely longitudinal. Labial plates light colored, with dark borders. Top of head black, with larger or smaller white or yellow spots.

This species ranges the entire Nearctic Realm, as far north as about latitude 40°. It is not found in the Neotropical Realm, unless the Lower Californian district be embraced in it.

The variability of this species is in some respects considerable, while in others it is quite constant. A number of distinct species have been proposed on its forms, most of which I felt compelled to reduce to this one as subspecies at the time of writing my Check-list in 1875. Further reduction is made now. The number of rows of scales is not constant. In the subspecies *O. g. getulus* they may be twenty-one or

twenty-three; and in the *O. g. boylii* they may number twenty-three or twenty-five. The characters based on color indicate natural geographical subspecies, but the transitions from one to the other are not lacking. The subspecies are defined as follows:

1. Scales in 21 to 23 rows.

Scales with yellow centers, sometimes collected into cross bands on the back; head yellow-spotted above *O. g. sayi*.

Narrow, white, dorsal cross bands, bifurcating on the flanks to embrace alternating black areas; head white-spotted above; or uniform black above; below with white spots; head spots few *O. g. getulus*.

2. Scales in 23 to 25 rows.

Scales of the sides with yellow or white centers; median dorsal region black, with cross bands of scales with yellow centers; top of head, except muzzle, black *O. g. splendidus*.

Black with complete white annuli, which are wider on the sides than on the back; top of head black, of muzzle white *O. g. boylii*.

Black, with more or less numerous longitudinal stripes above and on the sides; parts of annuli present or absent; top of head black; top of muzzle white.

O. g. californiæ.

The geographical distribution of these subspecies is well defined. Thus the *O. g. sayi* belongs to the Austroriparian region west of the Allegheny Mountains, and of the central region north to latitude 42°. The *O. g. getulus* occupies the Austroriparian and Eastern regions north to about latitude 42°. The *O. g. splendidus* is the type of the Sonoran district, and the *O. g. boylii* of the Pacific. The *O. g. californiæ* probably comes from the Lower Californian, but our specimens came from the southern part of the Pacific region.

This is the largest species of the genus, and is beautiful in all its forms. It is thoroughly harmless to mankind and can be handled to any extent without showing fear or anger.

OPHIBOLUS GETULUS SAYI Holbrook.

Ophibolus getulus sayi COPE, Check-list N. Amer. Batr. Rept., 1875, p. 37.

Coronella sayi HOLBROOK, N. Amer. Herp., III, 1842, p. 99, pl. XXII.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 619.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 41.

Coluber sayi DEKAY, N. York Fauna, Rept., 1842, p. 41.

Ophibolus sayi BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 84.

Lampropeltis sayi COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 254.

Herpetodryas getulus SCHLEGEL, Ess. Phys. Serp., II, 1837, p. 198.

Coronella getulus var. *sayi* JAN, Icon. Gén. Ophid., Pt. 14, pl. v, fig. 2.

Body, as in most of the other species, very tense and rigid, with difficulty capable of being extended after immersion in alcohol. Vertical plate triangular, wider than long; outer edge slightly convex, an angle being faintly indicated at the junction of the superciliaries and occipitals; shorter than the occipitals, which are short, longer than broad. Postfrontals large, broad; anterior smaller. Rostral small, not projecting, slightly wedged between prefrontals. Eye very small, orbit

about as high as the labial below it; center of the eye a little anterior to the middle of the commissure, over the junction of the third and fourth labials. One anteorbital, vertically quadrate; loreal half its height, square. Upper labials seven, increasing to the penultimate. Lower labials nine; fourth and fifth largest.

Scales nearly as high as long, hexagonal, truncated at each end. Dorsal rows twenty-one, exterior rather larger, and diminishing almost imperceptibly to the back, although all the scales in a single oblique row are of very nearly the same shape and size.

The scales on the back and sides are lustrous black, each one with a central elliptical or subcircular spot of ivory white, which on the sides occupy nearly the whole of the scale, but are smaller toward the back,

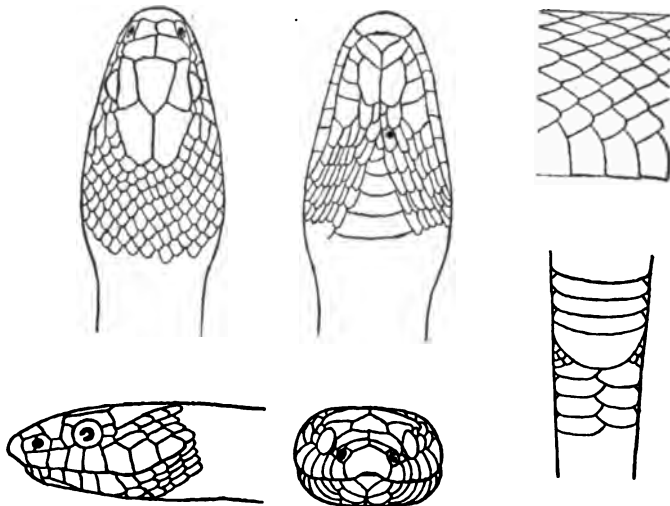


Fig. 226.

OPHIBOLUS GETULUS SAYI HOLBROOK.

= 1.

Shawnee Mission, Kansas.

Cat. No. 316, U.S.N.M.

where they involve one-half to one-third of the length. Beneath yellowish white, with broad distinct blotches of black, more numerous posteriorly. Skin between the scales brown. The plates on the top and sides of the head have each a yellowish blotch; the labials are yellow, with black at their junction.

Other specimens agree except in having bright yellow instead of white as described; the spots, too, are rather smaller, and manifest a slight tendency to aggregation on adjacent scales, so as to form transverse bands. This is seen more decidedly where the back is crossed by about seventy short dotted yellow lines; the fifty-sixth opposite the anus. The scales between have very obsolete spots of lighter, scarcely discernible. The sides are yellow, with black spots corresponding to

the dorsal lines; indeed, there may be indistinctly discerned two or three lateral series of alternating blotches.

In larger specimens from the West, this tendency in the spots to aggregation is still more distinct. The back is crossed by these dotted lines of the number and relation indicated, at intervals of four or five scales; the spots on the intervening space being obsolete. These lines bifurcate at about the ninth outer row, the branches connecting with those contiguous, so as to form hexagons, and these extending toward the abdomen again, decussate on about the third outer row, thus inclosing two series of square dark spots on each side. These lateral markings are, however, not very discernible, owing to the confusion produced by the greater number of yellow spots. On the edge of the abdomen are dark blotches, one opposite each dorsal dark space, the centers of the scutellæ being likewise blotched, but so as rather to alternate with those just mentioned.

Specimens from Indianola exhibit all varieties of coloration.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.
2381.....	7.	211 + 1.	52.	21.
1697.....	7.	224 + 1.	49.	21.
1700.....	7.	213 + 1.	50.	21.

Ophibolus getulus sayi Holbrook.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2381	1	Kemper County, Mississippi.		D. C. Lloyd.....	Alcohol type.
1723	1	Monticello, Mississippi.			do.
1697	1	Red River, Arkansas.		Capt. R. B. Marcy, U. S. A.	do.
699	1	Indianola, Texas.			do.
1724	1	Fort Towson, Arkansas.		Dr. L. A. Edwards, U. S. A.	do.
2280	2	Southern Illinois.		R. Kennicott.....	do.
5512	1	Fort Riley, Kansas.		H. Brandt.....	do.
316	1	Shawnee Mission, Kansas.		S. Paas. W. R. Exped.	do.
2350	1	Natchez, Kansas.			do.
1849	2	Fort Fillmore.			do.
6082	1	Jalapa, Mexico.		R. M. D'Oca.....	do.
2362	2	Tyree Springs, Tennessee.		Prof. R. Owen.....	do.
2319	1	Tusculum, Alabama.		B. Pylus.....	do.
5261	1	Fort Cobb, Texas.		C. S. McCarthy.....	do.
1735	1	Arkansas River.		Dr. S. W. Woodhouse.	do.
1715	1	Bridger's Pass, Wyoming Territory.		Lieut. F. T. Bryan, U. S. A.	do.
397	1	New Orleans, Louisiana.			do.
4288	1	do.		N. O. Academy.....	do.
9947	1	Arkansas.		Capt. J. P. McCown, U. S. A.	do.
10828	1	Senterfitt, Texas.		Frank Longfield.....	do.
12026	1	Mount Carmel, Illinois.	Nov. —, 1881	L. M. Turner.....	do.
1700	1	Indianola, Texas.		Col. J. D. Graham, U. S. A.	do.
15665		San Diego, Texas.		William Taylor.....	do.
17471-2		Cook, Nebraska.		E. M. Shaw.....	do.
22133		Irontdale, Washington County, Missouri.		Julius Hurter.....	do.
17477		Lafayette, Indiana.		F. C. Test.....	do.

OPHIBOLUS GETULUS GETULUS Linnæus.

Ophibolus getulus getulus COPE, Check-list N. Amer. Batr. Rept., 1875, p. 37.

Coluber getulus LINNÆUS; Syst. Nat., I, 1766, p. 382.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 358.—PEALE, Contr. Maclur. Lyc., I, 1829, pl. v.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 249.

Pseudoelaps getulus FITZINGER, Neue Class. Rept., 1826, p. 56.

Coronella getula HOLBROOK, N. Amer. Herp., III, 1842, p. 95, pl. 21.—DUMÉRIEIL and BIKRON, Erp. Gén., VII, p. 617.—JAN, Icon. Gén. Ophid., Pt. 12, pl. vi, fig. 1; Pt. 14, pl. v, fig. 1.

Anguis annulatus CATESBY, Nat. Hist. Carolina, II, 1743, p. 52, pl. III.

Ophibolus getulus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, 1853, p. 85.

Lampropeltis getulus COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 255.

Ophibolus getulus niger YARROW, Proc. U. S. Nat. Mus., V, 1882, p. 438.

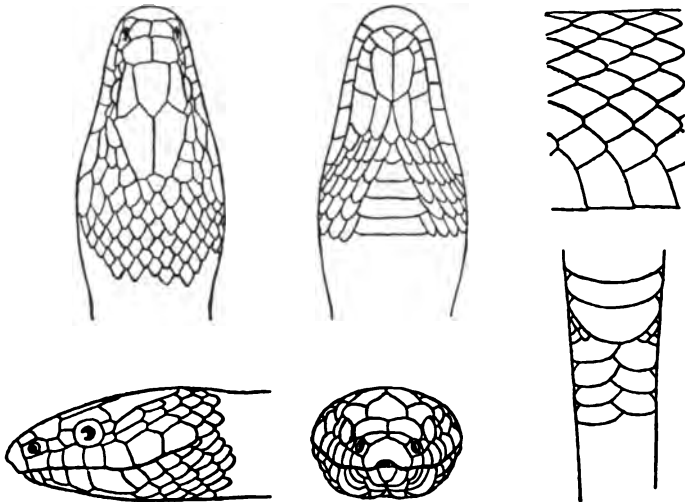


Fig. 227.

OPHIBOLUS GETULUS GETULUS LINNÆUS.

=1.

Newbern, North Carolina.

Cat. No. 8077, U.S.N.M.

Black, crossed by about thirty narrow, continuous yellow lines, which bifurcate on the flanks, the very obtuse angles embracing on each side a series of very much elongated patches, and in fact, by the union of the branches with each other, dividing the back into a succession of large black hexagons.

Very similar in general relations to *O. sayi*, although the body appears rather stouter, and the head and eyes somewhat larger in proportion. The color above is deep lustrous black, crossed by about thirty-three continuous yellow lines, the twenty-sixth opposite the anus. These lines, which on the middle of the back are narrow, one-half or one scale in width, widen rapidly till they meet the lateral series of black blotches, when they extend longitudinally in either

direction, and anastomose with their fellows. On each side, and alternating with the dark inclosures on the back, is a series of deep black blotches, extending from the abdomen (where those of opposite sides are generally confluent) over the first and second outer rows of scales. These blotches are rounded above, five or six scales long, and separated from the nearest dark part of the back by one or one-half scale. The outer edge of the abdomen and the exterior dorsal rows between these blotches being yellow causes the chain pattern to be continuous, inclosing a series of elongated dorsal spots from seven to ten scales long and about seventeen wide. Center of abdomen largely blotched with black, usually confluent with the blotches already mentioned. The plates on the head are black, with yellow spots.

The pattern as here described is subject to some irregularities, the chain being sometimes broken, and the lines oblique, not transverse, and the dark blotches of opposite sides not truly opposite to each other.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.
2376	7.	224.	48.	21.
4378	7.	213.	52.	21.
8077	7.	—	—	21.
2369	7.	—	—	23.
5509	8.	—	—	23.

It is specimens from Florida that possess twenty-three rows of scales, but not all of them, since Cat. No. 2375 has the normal number.

Ophibolus getulus getulus Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2369	1	Cedar Keys, Florida		G. Wurdemann	Alcoholic.
5509	1	Charlotte Harbor, Florida.		Dr. S. B. Barker	do.
2375	1	Indian River, Florida.		G. Wurdemann	do.
2376	1	Anderson, South Carolina.		C. P.	do.
4378	1	Charleston, South Carolina.		Dr. S. B. Barker	do.
8077	1	Newbern, North Carolina.			do.
8358	1	Kinston, North Carolina.		H. W. Welshe	do.
459	1	New York			do.
4380	1	Washington, District of Columbia.		W. Pierce	do.
2323	1	Gloucester, Virginia		Rev. C. Mann	do.
2294	1	Mississippi		Dr. B. F. Shumard	do.
7276	1	Port Tobacco, Maryland		Miss Marshall	do.
1857	1	Matamoras, Texas		Lieutenant Couch, U.S.A.	do.
8797	1	Augusta, Georgia.	Mar. 21, 1877	William Phillips.	do.
9109	1	Marietta, Georgia.	July 6, 1877		do.
9014	1	Sandy Springs, Maryland.	June —, 1877	J. P. Stabler	Cast.
9146	1	do	— —, 1877	do	do.
11428	1	do	do	do	Eggs.
10469	1	Oakley, South Carolina.	June —, 1880	A. L. Barker	Alcoholic.
12697	1	Hyattsville, Maryland.	— —, 1882	William Gass	do.
10688	1	Gainesville, Florida.	— —, 1880	James Bell	do.
10697	1	do			do.
10678	1	Nashville, Georgia	Nov. 18, 1880	W. J. Taylor	do.
10344	1	Laurel, Maryland.	July —, 1879	J. P. Stabler	do.
10816	1	Gainesville, Florida.		James Bell	do.
9146	1	Maryland.	July 5, 1877	J. P. Stabler	do.
10074	2	Homosassa, Florida.	Apr. —, 1879	J. W. Milner	do.
10098	1	Southampton County, Virginia.	May —, 1879	L. Kumlien	do.
15240	.....	District of Columbia		H. W. Henshaw	do.
15291	.....	Cherokee Nation, Indian Territory.		James Mooney	do.

Ophibolus getulus getulus Linnaeus—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
15483		Norbeck, Montgomery County, Maryland.	.....	Charles Abert.....	Alcoholic.
16698		Fernandina, Florida	.....	C. F. Batchelder.....	do.
17291		Washington, District of Columbia.	.....	C. W. Richmond.....	do.
17443		Dunn Loring, Virginia	.....	J. D. Figgins.....	do.
20692		Laurel, Maryland.....	.....	F. H. Knowlton.....	do.
21164		Chancellorsville, Virginia.	.....	Dr. Earl B. Silvers.....	do.
21360		South Island, Georgetown County, South Carolina.	.....	E. P. Alexander.....	do.
22367-8		Orange Hammock, De Soto County, Florida.	.....	Wm. Palmer.....	do.
22466		Mount Vernon, Virginia..	.....	I. H. Kuehling.....	do.

In his pamphlet on the Serpents of New York (Albany, 1854), Professor Baird remarks that this species is quite maritime in its northern distribution, being rarely found in the Northern States excepting near the coast. It is occasionally seen in Long Island, New York, according to DeKay, and more frequently in eastern New Jersey. It is not cited by Dr. J. A. Allen in his Catalogue of the Reptiles and Batrachians found in the vicinity of Springfield, Massachusetts,¹ nor is it included in the list of species found in the State which is included in the paper. In its western distribution it is not known from west of the Mississippi River.

This form is said to be an enemy and devourer of other snakes, especially of the venomous Crotalidæ. I have not personally met with a case of it. It is entirely inoffensive to man, making no hostile demonstrations. My daughter, when a girl of six or eight years, had several individuals as pets. They drank milk readily from a cup which she held in her hand.

Prof. O. P. Hay² says:

It is extremely active and strong. Holbrook says of it that it is found abundantly in moist and shady places, although it never takes to water or trees. It feeds on moles, small birds, or such reptiles as lizards, salamanders, toads, and the like, that fall in its way. He further says that it is commonly believed that it is the great enemy of the rattlesnake, but there is no great evidence of this. He, however, tells of one that had as a fellow-prisoner a *Crotalophorus milarius*, or Southern ground rattlesnake, and swallowed him. I found that in Mississippi this snake had the reputation of destroying rattlesnakes, and it received protection on this account. Dr. Elliott Coues³ says that the black snake (*Zamenis constrictor*) and *Ophibolus getulus sayi* wage a constant warfare against rattlesnakes and moccasins. They are said to be uniformly victorious and to eat their victims. It is on account of their prowess in thus destroying poisonous serpents that they have received the name of king snake. Mr. J. T. Humphreys, Burke County, North Carolina, gives⁴ an interesting account of a conflict in a cage between a king snake, *sayi*, and a water moccasin. The former was 42 inches long, the latter 34, but with a considerably

¹ Proc. Bost. Soc. Nat. Hist., XII, December, 1868.

² Batrachians and Reptiles of Indiana, Indianapolis, 1893, p. 110.

³ Bull. U. S. Geol. Geog. Surv., IV, 1878, p. 269.

⁴ American Naturalist, XV, p. 561.

larger body. The moccasin was killed, its bones crushed, and, beginning at the head, the king snake swallowed 16 inches of the moccasin's body. Chloroform was then administered and both snakes preserved. The king snake had previously, while in captivity, eaten seven snakes. Dr. Yarrow¹ describes a specimen of *getulus* in the National Museum that has two perfect heads. One head is a little larger than the other. The two gullets unite to pass into the one stomach.

The following is Yarrow's description of the black form of this subspecies called by him *Ophibolus getulus niger*:

Color entirely black, with the exception of the under part of the head; upper and lower labial marked like the typical *O. getulus getulus*. Head plates entirely black, not spotted, and in one of the specimens examined light central spots on the head scales are to be seen. Frontals, parietals, and superciliaries more elongated and narrower than in the normal type; frontals and prefrontals about the same. Abdominal scutellæ plumbeous, white spotted, not yellow. A peculiarity of the type specimens from which this description is prepared is that the third, fourth, and fifth postabdominal scutellæ are entire, not divided; but this last trait has been noticed in other species of the genus. In the specimen described, on the second and third row of scales are a few sparsely scattered white spots resembling those of *O. getulus sayi*, but there is no approach to regularity, nor is there any indication of a pattern. Seven upper labials on both sides; nine lower on one, ten on the other; twenty-one rows of scales, one anteorbital, two postorbitals. Length, 4 feet 6 inches.

A younger specimen, 3 feet 4 inches long, is similar in appearance to the older one, but there seems to be a tendency to a greater display of the white spots on the sides. Color of the back, lustrous black; belly dull black, with milk-white maculations. Isolated and minutely punctulated spots on the back show a decided approach to a pattern of coloration as in *O. g. getulus*.

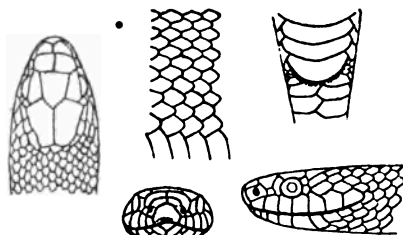


Fig. 228.

OPHIBOLUS GETULUS LINNÆUS.

Black variety.

Cat. No. 12029, U.S.N.M.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
12029	2	Mount Carmel, Illinois....	Nov. —, 1881	L. M. Turner	Alcoholic type. do.
12140	2	Wheatland, Indiana	— —, 1881	R. Ridgway	

It is uncertain whether this form is a true subspecies or not. The transition between it and the *O. g. sayi* is seen in Cat. No. 2362 of the latter, from Tennessee, where the spots are very few in number.

¹ American Naturalist, XII, p. 470.

OPHIBOLUS GETULUS SPLENDIDUS Baird and Girard.

Ophibolus getulus splendidus COPE, Check-list N. Amer. Batr. Rept., 1875, p. 37.

Ophibolus splendidus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p.

83.—BAIRD, U S. Mex. Bound. Surv., II, 1859, p. 20, pl. xiv.

Lampropeltis splendida COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 255.

Black above; the sides black, with a white spot in each scale. The body crossed by broad bands, consisting of white spots, one in each scale. Dorsal rows twenty-three.

Similar in general features to *O. g. boylii*. Vertical plate similar to that of *O. g. boylii*, but broader, and the sides more nearly parallel.

This species forms a connecting link, as to color, between the blotched

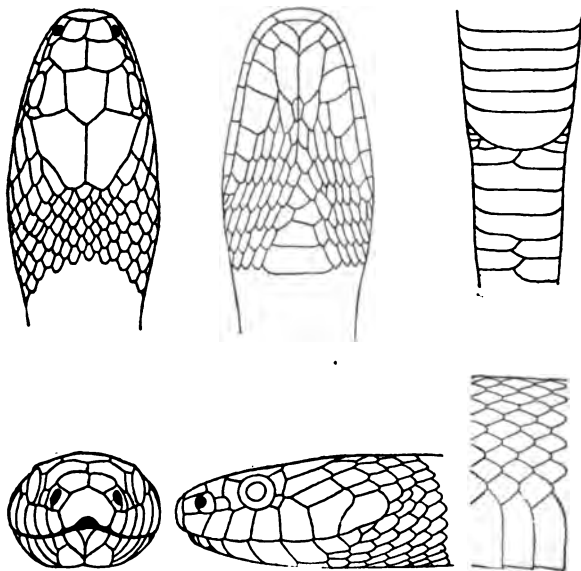


Fig. 229.

OPHIBOLUS GETULUS SPLENDIDUS BAIRD AND GIRARD.

= 1.

Cat. No. 18541, U.S.N.M.

varieties of *O. g. sayi* and *O. g. getulus*. There is a series of dorsal black blotches from head to tail; in one specimen sixty-three, the forty-ninth opposite the anus; in the other, fifty-two, the forty-first opposite the anus. These are four or five scales long and six or seven wide. The lighter intervals between are constituted by one or two transverse rows of spots, each one on a separate scale. The scales on the sides (from the first to the seventh or eighth rows) are black, each one with an elongated white blotch in the center. These blotches occupy nearly the whole scale on the exterior row, but diminish in amount toward the back. A series of rhomboidal darker spots is seen on each side opposite the light intervals, produced by the less amount of white on the scales at that place, and sometimes extend to the abdomen. The

abdomen is white, blotched not very deeply with black two or three scales wide, and a continuation of the dark shade in the prolongation of the lateral rhomboids. The blotches of the opposite sides are sometimes confluent and sometimes alternate. In one specimen the black patches are rather wider, extending nearly to the abdomen. Head less blotched with yellow than *O. g. boylii*. Differs from *O. g. boylii* in having the light intervals in the form of spots in the centers of dark scales, instead of covering the whole space. The lateral blotches are alternate with those of the back, not continuous and opposite. The blotches are more numerous.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.
1726.....	7.	219.	65.	23.
1849.....	7.	—	—	23.

This form approaches near to those of the *O. g. sayi* with transverse rows of spots on the median dorsal region. The head and nape are much less spotted than in the latter, and I have not found any variation in the different scale formulas of the two.

Ophibolus getulus splendidus Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1709	1	Sonora, Mexico	Col. J. D. Graham, U. S. A. . .	Alcoholic.
1726	2	Pecos River, Texas.....	Dr. C. B. R. Kennerly	do.
1849	2	Fort Fillmore.....	.....	do.
22373	4	Mesilla Valley, New Mexico.	T. D. A. Cockerell.....	do.

OPHIBOLUS GETULUS BOYLII Baird and Girard.

Ophibolus getulus boylii COPE, Check-list N. Amer. Batr. Rept., 1875, p. 37.

Ophibolus boylii BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 82.

Coronella balteata HALLOWELL, U. S. Pac. R. R. Surv. Rept., X, Williamson's Rept., p. 14, pl. v; Proc. Acad. Nat. Sci. Phila., 1853, p. 236.

Lampropeltis boylii COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 255.

Coronella getulus var. *pseudogetulus* JAN, Icon. Gén. Ophid., Pt. 12, pl. vi, fig. 2.

Ophibolus boylii var. *conjuncta* COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 301.

Ophibolus getulus conjunctus COPE, Bull. U. S. Nat. Mus., No. 1, 1875, p. 37.—YARROW and HENSHAW, U. S. Geog. Surv. W. of 100th Mer., V, 1878, p. 212.

Lampropeltis conjuncta VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, p. 142.

Black, with upwards of thirty broad ivory-white transverse bands, widening on the sides. Dorsal rows of scales twenty-three.

Vertical plate distinctly pentagonal, longer than broad; more elongated than in *O. sayi*. Sides nearly parallel, a little shorter than the occipital plates. The sides of the head as in *O. sayi*. Dorsal rows twenty-three, the scales rather more elongated than in *O. sayi*. Outer row a little larger, all the rest nearly equal. Back and sides black, crossed by about thirty-seven ivory-white bands, the thirtieth opposite the anus. On the vertebral region these bands are about one and a half scales wide, with the margins parallel to about the seventh outer

row of scales, where they begin to widen, so as to embrace from five to seven scales on the outer row. They continue of this width to the middle of the abdomen, where they are either confluent with the white of the opposite side, or are opposite to the black interval on the other side. The black interval between the cross bands is some eight to ten scales long, narrowing on the sides as the white spaces enlarge, until on the outer dorsal rows it occupies them to four scales, and is continued to the middle of the abdomen; owing to a slight obliquity of the dark patches on the back their abdominal extensions are very apt to alternate with each other on the middle of the abdomen, instead of being directly opposite and confluent. Every transition from the one

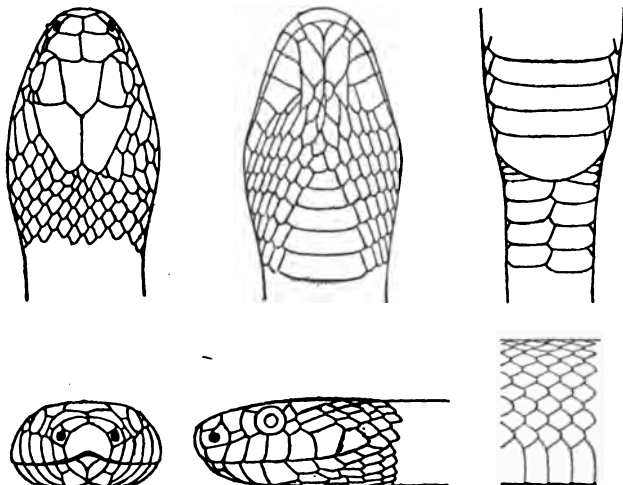


Fig. 230.

OPHIBOLUS GETULUS BOYLIi BAIRD AND GIRARD.

= 1.

Pasadena, California.

Cat. No. 1717, U.S.N.M.

condition to the other is observable. The general pattern is thus: A black body, encircled by white rings, which are wider on the sides and beneath. The end of the tail is distinctly annulated. Occasionally some of the black scales on the sides have indistinct white spots in the centers. Labials, plates on the sides of the head, and above in front of the vertical, yellow, with black margins.

Cat. Nos.	Upper labials.	Gastroteges.	Urostege.	Scales.
1693.....	7.	240 + 1.	52.	23.
11787.....	7.	—	—	23.
7847.....	7.	—	—	23.
4284.....	7.	—	—	25.
12624.....	7.	—	—	25.

The variety which I called *conjunctus* differs from the typical *boylii* in having the white scales black at the base, so that the annulate pattern

is much obscured, and a slight approximation to the subspecies *splendidus* is presented. According to Van Denburgh the young can not be distinguished from that of *O. g. boylii*. On the other hand, the type called by Yarrow *multicinctus* has the white cross bands more numerous than in the typical *L. g. boylii*.

This handsome form inhabits regions of diverse climate, ranging from the comparatively rainy region of northern California to the dry southern extremity of Lower California and the arid deserts of southern Arizona and southern Nevada. It has not been taken east of Arizona. The form *conjunctus* is from the southern extremity of Lower California, while the *multicinctus* type is from southern California.

Dr. Merriam, in his report on the Death Valley Expedition, gives the following note in regard to the distribution of this species:

This large and conspicuous snake, whose cream-colored body is sharply marked by rings of black, was first found in the valley of the Lower Muddy, near an abandoned mill at Overton, Nevada, where several were secured in dense thickets of *Atriplex torreyi*. About dark they began to emerge from these retreats, making a great noise in crawling over the dry leaves, and were soon found in the open. The species was obtained also in Pahrnagat Valley, Nevada, a little north of the middle of the valley. On the west slope of the Sierra Nevada, in California, specimens were collected in Kern Valley, at Three Rivers, and on the east fork of Kaweah River.

Ophibolus getulus boylii Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1698	1	Eldorado County, California.	.....	.....	Alcoholic.
8144	1	San Francisco, California.	.....	Lient. R. S. Williamson, U. S. A.	do.
4285	1	Fort Tejon, California.	.....	John Xantus	do.
1703	1	Fort Reading, California.	.....	Lient. R. S. Williamson, U. S. A.	do.
7847	2	Fort Whipple, Arizona.	.....	E. Palmer	do.
8426	1	Southern Arizona	Oct. —, 1873	Dr. C. G. Newberry	do.
1713	1	Colorado Desert	.....	Maj. W. H. Emory, U. S. A.	do.
4284	1	Fort Yuma, California.	.....	Maj. G. H. Thomas, U. S. A.	do.
8577	1	Santa Barbara, California.	— —, 1875	W. L. Schumaker	do.
1730	1	San Francisco, California.	.....	R. D. Cutts	do.
6288	1	Cape St. Lucas, L. California.	.....	John Xantus	do.
10796	1	McCloud River, Washington.	Feb. 10, 1876	Livingston Stone	do.
11420	1	Fort Whipple, Arizona.	April —, 1880	Dr. E. Coues, U. S. A.	do.
11787	2	Fresno, California	— —, 1880	Gustav Eisen	do.
12624	3	La Paz, L. California	Feb. —, 1882	L. Belding	do.
	1	St. Thomas, Nevada	.....	E. Palmer	do.
11753	1	Fresno, California	.....	G. Eisen	(Type of <i>O. g. multicinctus</i> .)
	1	Cape St. Lucas, Lower California.	.....	J. Xantus	(Type of <i>O. g. conjunctus</i> .)
10390	1	Fort Mojave, Arizona	— —, 1879	Dr. R. E. Lightburne	Alcoholic.

Ophibolus getulus boylii Baird and Girard—Continued.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When collected.	From whom received.
			<i>Feet.</i>		
18090		Three Rivers, California		July 27, 1891	Palmer.
18091		do		do	Fisher.
18092		South Fork, Kern River, 25 miles above Kernville, California.		July 9, 1891	do.
18093	Young	East Fork, Kaweah River, California	1,700	July 27, 1891	Bailey.
18094		Overton, Muddy Valley, Nevada		May 6, 1891	Merriam.
18095		do		do	Bailey.

Catalogue No.	Locality.	From whom received.
16341	San Diego, California	C. R. Orentt.
16521	do	do.
22196	Fort Huachuca, Arizona	Fisher.

OPHIBOLUS GETULUS CALIFORNIAE De Blainville.

Ophibolus californiae COPE, Check-list N. Amer. Batr. Rept., 1875, p. 37.

Coluber (Ophis) californiae DE BLAINVILLE, Ann. Mus. d'Hist. Nat. Paris, III, 1834, p. 60, pl. XXVII, figs. 1, 1a, 1b.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 153.

Coronella californiae DUMÉRIEUX and BIBRON, Erp. Gén., VII, 1854, p. 623.

Ophibolus getulus eisenii YARROW, Proc. U. S. Nat. Mus., V, 1882, p. 439.

Coronella getulus californica JAN, Icon. Gén. Ophid., Pt. 14, pl. v, fig. 3.

Lampropeltis nitida VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, pl. XIV, p. 143.

Plates of the head similar to those of *O. getulus boylii*: One anteorbital, three postorbitals, seven upper labials, ten lower labials, twenty-three rows of scales on body; difference, so far as the head is concerned, being an increase in number of postorbitals and lower labials.

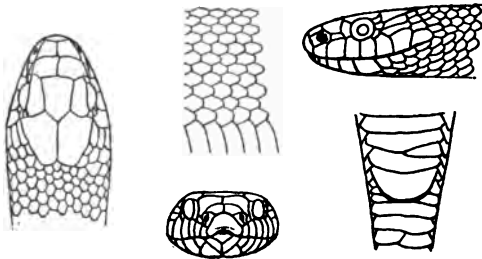


Fig. 231.

OPHIBOLUS GETULUS CALIFORNIAE DE BLAINVILLE.

Fresno, California.

Cat. No. 11788, U.S.N.M.

Color markedly different from the type of *O. getulus boylii*. The first white annulus, three scales wide, begins eleven scales posteriorly to the parietals. There is then an interval of five scales to the third white annulus, which, instead of passing down toward the abdomen, expands at the base and joins an oval ring eight scales wide transversely to the body and eight scales long posteriorly. Eight scales behind this ring a longitudinal white line one and one-half scales wide commences, which extends the length of body to opposite the two hundred and seventh abdominal scute, or about the thirtieth from the anus. This line is absolutely continuous, but breaks off into annuli at the place mentioned. There are then a triangular white blotch, three annuli, another blotch, and

the dorsal line begins again, and ends at the tip of the tail. At distances of four and seven scales below this dorsal line, on both sides, are indications of lines, which are nearly complete in one of the specimens; in others they are broken into whitish blotches longitudinally arranged. Color of head and upper part of body pitchy, lustrous black; middle, lower third, and tail blackish brown.

This subspecies presents a very different facies from the *O. getulus boylii*. The head and neck resemble *O. g. boylii* in markings and coloration, but the appearance of the body and tail is entirely different.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.
11788.....	7.	233.	58.	23.
13888.....	7.	246.	53.	23.

Ophibolus getulus californicus De Blainville.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
11788	1	Freano, California	— —, 1880	Gustav Eisen	Alcoholic type.
11787	1	do	— —, 1880	do.....	Alcoholic young.
11744	1	do	— —, 1880	do.....	Alcoholic.
11747	1	do	— —, 1880	do.....	do.
11787	1	do	— —, 1880	do.....	do.
16355	.....	San Diego County, California.....	.....	C. R. Orcutt	do.
20496	.....	Witch Creek, San Diego County, California.....	.....	H. W. Henshaw	do.
22030	.....	San Ysidra Ranch, Lower California.....	.....	Dr. E. A. Mearns	do.

The transition between this form and the *O. g. boylii* is accomplished by specimens Cat. Nos. 11747-87. In these the crossbands are numerous; in the former there are four on the anterior part of the body and seven on the posterior part anterior to the tail, the latter being also crossbanded. In Cat. No. 11787 a longitudinal median stripe extends through much of the length, but the sides have vertical blotches representing the corresponding crossbands on the *O. g. boylii*.

In De Blainville's type of this species there are no transverse bands, and the lateral stripes are but little interrupted. The dorsal stripe is, on the other hand, interrupted at several points.

In a specimen without locality in the U. S. National Museum, the body and tail are black above and yellowish-white below. A pure white stripe runs on the vertebral line from the nape to the end of the tail, and another on the first and second rows of scales on the anterior four-fifths of the length. Mr. Van Denburgh describes a specimen from Cape St. Lucas which is black above and below, including the head, except a cinnamon-colored vertebral stripe and some cinnamon-colored spots on the nape and on the superior aspect of the tail, where the stripe is wanting.

STILOSONA Brown.

Stilosoma BROWN, Proc. Acad. Nat. Sci. Phila., 1890, p. 199.—COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 595.

Body slender, cylindrical; tail short; head not distinct from body. Rostral prominent, but not recurved; no prefrontals or loreals. One nasal. Scales smooth. No scale pits. Anal entire. Teeth smooth.

This genus is probably a degraded ally of *Ophibolus*. Dr. Stejneger suggested an affinity to that genus, and my examination of the penial structure confirms this view. It is interesting to find the only species in Florida, where occurs also the *Osceola elapsoides*, the most reduced form of its genus.

STILOSONA EXTENUATUM Brown.

Stilosoma extenuatum BROWN, Proc. Acad. Nat. Sci. Phila., 1890, p. 199.—LÖNNBERG, Proc. U. S. Nat. Mus., 1894, p. 323.—BOULENGER, Cat. Slakes Brit. Mus., II, 1894, p. 325.

Eye moderately small. One nasal, with nostril in the center. Prefrontals large, in contact with the second and third labials, and forming, with the latter, the anterior border of the orbit. Frontal hexagonal, the

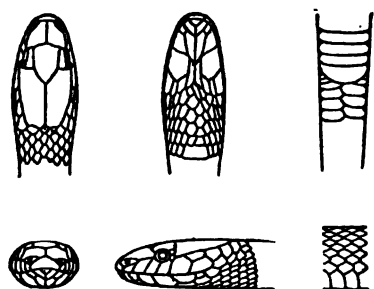


Fig. 232.

STILOSONA EXTENUATUM BROWN.

× 1.5.

From type in Museum Academy of Natural Sciences, Philadelphia.

anterior angle obtuse. Superciliaries short and broad. Parietals large, bounding the postorbitals behind and touching the fifth labial. Two small postorbitals, the lower one resting on a notch between the fourth and fifth labials. Three temporals in a horizontal series, the first lying between the fifth and sixth labials and the parietals. Six superior labials, third and fourth in orbit, fifth largest. Five lower labials, fourth very large. Three pairs of chin shields. Nineteen rows of dorsal scales, lozenge shaped

and perfectly smooth. Abdominal scutellæ, 235–260. Subcaudals small, in 40–44 pairs.

Ground color silvery-gray, with sixty-one dorsal spots of dark brown with blackish border, from head to anus, and eleven on the tail. Anteriorly the spots are from two to four scales long and from five to seven wide, posteriorly becoming smaller. The interspaces are about equal in length to two spots and have the three median rows of scales mottled with pale red. Under surface of body silvery-gray, much blotched with black, which runs up on the three exterior rows of scales, opposite the intervals between the dorsal spots. On the sides each light scale is finely punctuated with black. An elongated triangular dark patch on the parietals pointing backward, and a small dark blotch just below it on each side of the neck. A dark bar running back from the

eye on the upper margin of the labials. The fore part of the head and chin and throat much maculated with black.

Measurements.—Total length of specimen, 532 mm. (21 inches); length of tail, 50 mm. (2 inches).

Dr. Stejneger¹ remarks on this subject as follows:

The type specimen of *Stilosoma extenuatum* is described as possessing no separate prefrontals (these being fused with the internasals), no loreal, and no preoculars. The large internasals join the supralabials and enter the eye, and the parietals join the supralabials behind the postoculars, excluding the temporals from the latter.

The three additional specimens seem to prove that the only normal and stable characters among the above are the absence of the loreal and the joining of the parietals and supralabials. The absence of the preocular is only found in the type, while the fusion of the internasals with the prefrontals is found in the type and in one of the Orange County specimens as well, but not in the other two, in which they are normally separated.

CONTIA Baird and Girard.

Contia BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 110.—COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 251; Bull. U. S. Nat. Mus., No. 32, 1887, p. 53.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 255.

Eirenis JAN, Elenco Sist. Ofid., 1863, p. 48.

! *Sonora* BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 117.

Dentition complete, and the teeth of maxillary bone of equal length. The scales are smooth and without pits, and the anal plate is divided. The head shields are normal; the nasal, usually entire in the genus, is sometimes half divided by a suture from the nostril to the labial border. Two pairs of genuals; a loreal; rostral obtuse. The head is little distinct from the body, and the pupil is round.

There is but one Medicolumbian species, and it is characterized as follows:

Scales in 15 rows; superior labials 7; body depressed, rostral not prominent; back brown, with pale edges; sides lead-colored; below crossbarred.

C. mitis Baird and Girard.

CONTIA MITIS Baird and Girard.

Contia mitis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 110.—

GIRARD, U. S. Expl. Exp., Herpt., 1858, p. 125, pl. x, figs. 6–12; Rep. U. S. Expl. R. R., X, Pt. 3, 1859, pl. xxxvi, fig. 7.—COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 74; Check-list N. Amer. Batr. Rept., 1875, p. 36.—GARMAN, N. Amer. Rept., 1883, p. 93.—BOCOURT, Miss. Sci. Mex., Rept., 1883, p. 557, pl. xxxiv, fig. 3.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 297.

Ablabes purpureocauda GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 245.

Homalosoma mite JAN, Arch. Zool. Anat. Phys., II, 1862, p. 35; Icon. Gén. Ophid., 1865, Pt. 13, pl. iv, fig. 1.

Head ovoidal and with the body much depressed, rather short, with the snout truncated. One anterior and two or one postorbitals. Eye small. Dorsal scales in fifteen rows.

Head almost as deep as the body, snout protruding over the lower jaw, and obliquely truncated. Vertical plate hexagonal, sides nearly

¹ Proc. U. S. Nat. Mus., XVII, 1894, p. 323.

parallel, posteriorly very acute. Occipitals elongated, truncated posteriorly, slightly convex exteriorly. Postfrontals large and angular. Prefrontals subangular, much smaller. Rostral well developed, broad, but slightly produced between the prefrontals. Nasal quadrangular, longer than high, with nostril in the middle, a little nearer the anterior than posterior edge of the plate. Loreal elongated and quadrangular,

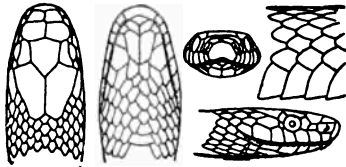


Fig. 233.

CONTIA MITIS BAIRD AND GIRARD.

× 1.5.

San Jose, California.

Cat. No. 2034, U.S.N.M.

situated above the second labial. Anteorbital angular and elevated, situated above the third labial. Postorbital angular, larger than the anteorbital, situated above the commissure between the fourth and fifth labials. Superciliaries proportionally small and oblong. A large and angular elongated temporal shield. Upper labials, seven; anterior and posterior ones smaller; third and fourth beneath the eye; lower

labials, seven; fourth largest. Posterior pair of mental scutellæ very small. Two scutellæ on each side, along the fifth, sixth, and seventh infralabials.

Body slender, subcylindrical, broader than deep. Scales proportionally large, subelliptical, posteriorly rounded or subtruncated. Those of the exterior row conspicuously broader. Tail short, conical, and tapering.

Deep chestnut-brown above, with two longitudinal light bands, one on each side of the back, below which is a series of black dots. Scales minutely dotted with black. Anterior half of the scutellæ black; posterior half light yellow.

The lighter bands of the back cover the fourth exterior row of dorsal scales; the series of black dots is immediately beneath on the third row of scales. Tip of scales of exterior row black. Head above, blackish brown; beneath, mottled with black, on a yellowish green ground. The abdomen is regularly and transversely barred with black and light yellow.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.
2034	7.	167 + 1.	31.	15.
8075	7.	154 + 1.	35.	15.

Contia mitis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2034	1	San Jose, California.....	.....	Dr. J. L. LeConte.....	Alcoholic type.
8075	1	Oregon .....	.....	.....	Alcoholic.
2036	1	Petaluma, California.....	.....	E. Samuels	do.
11751	1	Fresno, California	—, 1899	Gustav Eisen	do.
11777	3	do	—, 1899	do.....	do.
		Baird, Shasta County, California.....	.....	C. Townsend	do.
	1	Butte County, California..	.....	.....	do.

LODIA Baird and Girard.

Lodia BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 116.

Head ovoidal, distinct from the body. Two vertical plates, a small anterior one being situated between the postfrontals immediately in advance of the vertical proper. One nasal. Loreal entering into the orbit; above it one anteorbital. Superciliaries elongated and well developed. Mental scutellæ one pair. Pupil circular. Scales smooth. Postabdominal scutella bifid. Subcaudal, all in pairs.

LODIA TENUIS Baird and Girard.

Lodia tenuis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 116.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 36.

Frontal plate hexagonal, as broad anteriorly as posteriorly, wider than in *Contia mitis*. Anterior frontal ovoidal or subelliptical, intermediate between the postfrontals, which are angular and extend to the sides of the head. Internasals subtriangular, about half the size of

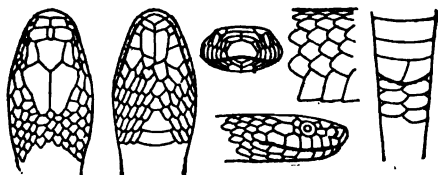


Fig. 231.

LODIA TENUIS BAIRD and GIRARD.

× 1.5.

Puget Sound, Washington.

Cat. No. 7289, U.S.N.M.

prefrontals. Rostral broad and well developed. Occipitals subangular externally, proportionally large and elongated. Nasals large, nostrils in the middle, between both plates. Loreal large, polygonal, elongated, situated above the commissure of the second and third upper labials, entering into the orbit as an inferior anteorbital. A quadrangular superior anteor-

bital, inclosed between the postfrontal, superciliary, and loreal. Two angular postorbitals, inferior one resting on the commissure of the fourth and fifth labials. Superciliaries oblong. Temporal shields 1-2, conspicuous, anterior one elongated and largest. Mouth deeply cleft. Upper labials six, the three posterior ones a little larger than the three anterior. Lower labials six, fourth largest. Mental scutellæ one pair. Body slender, subcylindrical; tail short, conical, and tapering. Scales proportionally large, rhomboidal, smooth, forming fifteen dorsal rows; outer row but slightly broader than the rest.

Body dull brown above, bluish on the sides, with a longitudinal lighter stripe on each flank. Abdomen lighter; bases of scutellæ bluish. Tail beneath unicolor with an external series of bluish spots.

Cat. No. 7289; upper labials, 6; gaurosteges, 150 + 1; urosteges, 33; scales, 15.

Lodia tenuis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
7289	1	Puget Sound, Washington..	Exploring Expedition	Alcoholic.

The typical specimen still continues to be the only one known.

This species so much resembles the *Contia mitis* as to lead to the suspicion that its generic peculiarities are abnormalities of the head scuta. The relations of the loreal plate are, however, symmetrical, and the frontal plate is wider than in the *C. mitis*. The coloration is identical in alcohol. The head is relatively shorter; and to this fact are to be ascribed its tegumental peculiarities. It is in any case a type of recent origin.

CEMOPHORA Cope.

Cemophora COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 244; Bull. U. S. Nat. Mus., No. 32, 1887, p. 50; Proc. U. S. Nat. Mus., XIV, 1892, p. 602.—JAN, Elenco Sist. Ofid., 1863, p. 45; Arch. Zool. Anat. Phys., II, 1863, p. 230.—BOCOURT, Miss. Sci. Mex., Rept., 1883, p. 567.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 213.

Stasiotes JAN, Arch. Zool. Anat. Phys., II, 1862, p. 75.

Head small, continuous with the body. Rostral plate large, prominent, subtriangular. One pair of prefrontal plates and one of internasals. One nasal; nostril in the middle. One loreal. Preorbitals and postorbitals present. Superciliaries, eyes, and mouth small. Teeth longer posteriorly. Scales smooth. Postabdominal scutella entire. Subcaudal scutellæ bifid.

But one species of this genus is known. Its general characters are as follows:

Scales in 19 rows; superior labials six, the eye over the third; tail about one-eighth of total length; red, crossed by pairs of black rings separated by a yellow one, which is divided by a black spot on the side *C. coccinea*.

CEMOPHORA COCCINEA Blumenbach.

Cemophora coccinea COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 244; Proc. U. S. Nat. Mus., XIV, 1892, p. 602.—JAN, Arch. Zool. Anat. Phys., II, 1863, p. 230; Icon. Gén. Ophid., 1865, Pt. 11, pl. v, figs. 1, 2.—GARMAN, N. Amer. Rept., 1883, p. 78, pl. VI, fig. 1.—BOCOURT, Miss. Sci. Mex., Rept., 1883, p. 567, pl. xxv, fig. 6.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 214.

Cemophora copii JAN, Icon. Gén. Ophid., 1865, p. 11, pl. v, fig. 3.

Coluber coccineus BLUMENBACH, Voigt's Mag. Phys. u. Naturg., V, 1788, p. 11, pl. I.—DAUDIN, Rept., VII, 1803, p. 43, pl. LXXXIII, fig. 1.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 356; Phys. Med. Res., 1835, p. 119.

Elaps coccineus MERREM, Tent., 1820, p. 145.

Heterodon coccineus SCHLEGEL, Ess. Phys. Serp., II, 1837, p. 102, pl. III, figs. 15, 16.

Rhinostoma coccineus HOLBROOK, N. Amer. Herp., III, 1842, p. 125, pl. xxx.—BAIRD and GIRARD, Cat. N. Amer. Rept., 1853, p. 118; Rep. U. S. Expl. Surv. R. R., X, Pt. 3, 1859, pl. xxxiii, fig. 89.

Simotes coccineus DUMÉRIL and BIBRON, Erp. Gén., VII, 1854.—GÜNTHER, Cat. Colubr. Snakes Brit. Mus., 1858.

Body yellowish red (said to be crimson in life), crossed by pairs of black rings, inclosing each a yellow one.

Body slender, cylindrical, tense, and rigid. Dorsal scales rhomboidal, rather elongated. Vertical plate very large, cordiform or subhexagonal, almost as broad anteriorly as long; obtuse angled before, acute angled behind; the two outer sides short, parallel. Occipitals large, a little

longer than the vertical. Postfrontals large; prefrontals much smaller. Rostral projecting forward, acute, causing the snout to be pointed, not recurved nor compressed into a ridge as in *Heterodon*. Eye small, its center over the third labial, and over the middle of the commissure. Postorbitals two; anteorbital one. The superciliaries are very small and narrow, in one specimen looking like an upper postorbital. One line of temporal shields. Loreal small. One nasal; nostril situated in its center, with a rounded groove to the lower edge, sometimes to the upper, apparently separating two nasals. Upper labials six, the third constituting the greater portion of the orbit below, with the lower postorbital resting upon it and on the second; all the labials nearly equal in size, fourth and fifth largest. Lower labials eight, fifth largest.

The back and sides are embraced by about twenty elongated longitudinal black rings (the sixteenth opposite the anus), their anterior and posterior sides on the dorsal line, their lateral resting on the outer dorsal row. Across the back the black is well defined and continuous, about two scales long; on the sides, however (from the first to the third rows), the black is interrupted more or less, sometimes reduced to a few scattered scales. The intervals between the successive rings are yellow, with the centers of the scales dusky (they sometimes have only a narrow margin of yellowish), and on the sides may be seen a distinct rhomboidal black spot

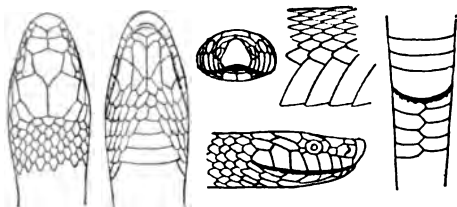


Fig. 235.

CNEMIDOPHORUS COCCINEUS BLUMENBACH.

= 1.

Volusia, Florida.

Collection of E. D. Cope.

opposite each dorsal light interval. This is sometimes broken up and confused with the black of the rings on the sides. The large spaces inclosed by the rings themselves are yellowish red (said to be crimson in life), six to nine scales long, and about thirteen wide; they are variable in length, being larger at about the anterior third than elsewhere. Beneath uniform yellowish white. The first ring crosses just behind the occipital plates, and in front of it is a narrow black band crossing the middle of the occipitals, from one angle of the mouth to the other, sometimes connected with the first ring by a narrow black line. Rest of the head yellowish. Another specimen has twenty-six rings, the twentieth opposite the anus.

A specimen from Prairie Mer Rouge has the whole lower wall of the orbit constituted by the third labial, with both anterior and posterior orbitals resting upon it. The vertical is more elongated. The anterior dorsal ring, instead of being continuous, is divided anteriorly, and the ends, after approximating, are bent back on the occipitals and extend to the eye. The snout, too, is rather more pointed. In a second speci-

men from the same locality the third labial only enters the eye on one side, and the second and third on the other, in the usual way.

In this species the loreal plate makes various approaches to the border of the orbit, in some instances entering it, according to Professor Jan, who figures it in a specimen from Tennessee. He regards the character as indicating a species which he calls *Cemophora copei*; but in a Floridian specimen the character is so intermediate as to show that it has no systematic value.

The *Cemophora coccinea* is a species of the Austroriparian region, but it has not been found in the Texan district, nor does it ascend the Mississippi River as far as the region extends. It is especially abundant in Florida.

Cemophora coccinea Blumenbach.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2287	1	Anderson County, South Carolina.		Miss C. Paine.	Alcoholic type.
6298	1	Fort George, Arkansas.		?	Alcoholic.
2185	2	Prairie Mer Rouge, Louisiana.		Jas. Fairie.	do.
2189	1	Monticello, Mississippi.		?	do.
2307	1	New Orleans, Louisiana.		?	do.
5221	1	Athens, Alabama.		W. M. Stewart.	do.
9688	1	Arlington, Florida.	May—, 1878.	G. Brown Goode.	do.
10803	1	South Carolina.		Dr. Geo. A. Moran.	do.
9287	1	?		Capt. Wm. Holden.	do.
10741	1	Clear Water, Florida.		S. T. Walker.	do.
11430	1	Columbia, South Carolina.		Geo. Shoemaker.	do.
12536	1	?		G. B. Goode.	do.
14828	1	Georgiana, Florida.		Wm. Wittfield.	do.
16951	.....	St. Margaret's, Anne Arundel County, Maryland.		A. A. Stinchcomb.	do.

RHINOCHILUS Baird and Girard.

Rhinochilus BAIRD and GIRARD, Cat. Rept. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 120.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 36; Proc. Amer. Phil. Soc., 1886, p. 487; Bull. U. S. Nat. Mus., No. 32, 1887, p. 152.

Head subelliptical, pointed on the snout, and separated from the body by a contracted neck. Rostral plate large, overhanging, but not recurved above. Two pairs of frontal plates. Two nasals; nostrils intermediate. One loreal. One anterior orbital. Superciliaries large. Scales smooth. Postabdominal scutella entire. Subcaudal scutellæ all undivided.

Two species of this genus are known, as follows:

Scales in twenty-three rows; labials eight; tail one-tenth total length; a dorsal series of numerous square, black spots, separated by red spaces; sides black, varied; belly white *R. lecontei*.
Scales in seventeen rows; labials eight; tail one-eighth total length; a few broad and long cross-bands on body above, extending to the borders of the belly.

R. antonii.¹

¹ Dugès, Proc. Amer. Phil. Soc., 1886, p. 290. From Mazatlan, Mexico.

RHINOCHILUS LECONTEI Baird and Girard.

Rhinochilus lecontei BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 120; Rept. U. S. Expl. R. R., X, Pt. 3, 1859, pl. XXXIII, fig. 90.—BAIRD, U. S. Mex. Boundary Surv., II, Rept., 1859, p. 21, pl. XX.—JAN, Arch. Zool. Anat. Phys., II, 1863, p. 217; Icon. Gén. Ophid., 1876, Pt. 48, pl. III, fig. 1.—COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 304; Check-list N. Amer. Batr. Rept., 1875, p. 36; Proc. U. S. Nat. Mus., XIV, 1892, p. 606.—GARMAN, N. Amer. Rept., 1883, p. 73.—BOCOURT, Miss. Sci. Mex., Rept., 1886, p. 602, pl. XL, fig. 7.—GÜNTHER, Biol. Centr.-Amer., Rept., 1893, p. 100.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 212.

Head distinct from the body; broad behind, nearly flat above. Vertical plate hexagonal, elongated, largest anteriorly, the lateral edges tapering, and constituting the longest sides of the figure. Superciliaries quite large. Occipitals subangular, proportionally small. Prefrontals large compared to the postfrontals. Rostral prominent forward, rounded beneath, tapering upward. Eyes large, over the junc-

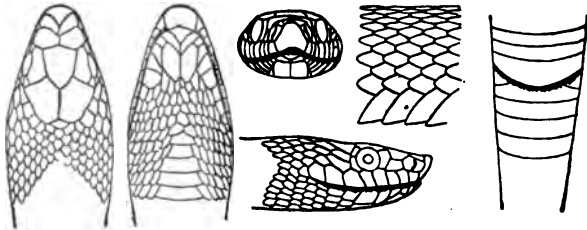


Fig. 236.

RHINOCHILUS LECONTEI BAIRD AND GIRARD.

=1.

San Angelo, Western Texas.

Collection of E. D. Cope.

tion of the fourth and fifth upper labials, about opposite the middle of the commissure. Postorbitals two, lower in notch between the fifth and sixth labials, although resting more on the latter. Anteorbital large, resting on the fourth labial, the fourth and fifth labials constituting equally the inferior part of the orbit. Loreal elongated, horizontal, trapezoidal, well developed. Nasals apparently double, perhaps a single one very much excavated. Two temporal shields between the occipitals and labials. Labials eight above, seventh largest; eight below, fifth largest. Dorsal rows of scales twenty-three, all perfectly smooth; scales rhomboidal, nearly equal, but rather narrow above. Abdominal scutellæ two hundred and six; posterior one entire. Subcaudal scutellæ forty, all entire.

The body is crossed by about thirty-three quadrate black blotches, the twenty-seventh opposite the anus. These are nearly of the same length, and of the same distance apart throughout, four scales long, and extending between the second external rows, where their sides are rather rounded or angulated. The black is very deep and continuous

on the four or five central rows of scales, whence to the flanks it is varied by having the centers of each scale reddish yellow. The intervals between the blotches are exactly the reverse; above they are uniform pale red, and on the sides the centers of each scale are black. Sometimes scattered black scales may be observed on the back in the light spaces. Beneath yellowish white, unspotted. The two outer rows of scales of the same color, but with a short black bar extending from the middle of each light and each dark space, perpendicularly to the abdomen, the extreme edge of which is sometimes involved. The head and half its length behind are black, spotted with yellowish on the sides. The snout and labials yellowish, the plates margined with black.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
4472.....	8.	199 + 1.	50.	23.	732.	109.
8021.....	8.	212 + 1.	51.	23.	295.	41.
2016.....	8.	207 + 1.	46.	23.	585.	78.

This species displays remarkable variations in coloration. In Cat. No. 5168 the large blotches are perfectly distinct, and their lateral interspaces have but faint traces of markings. In Cat. Nos. 2020, 2023, 2030, 2031, 11743, 11784, all of small size, and Cat. No. 2016, fully grown, there is a vertical black spot between the dorsal blotches on each side. In Cat. Nos. 8376, 4471, 4472 the entire space on the sides between the dorsal blotches is marked with a black spot on the center of each scale. Cat. Nos. 8021 and 8022 are more like the first noted variety, but carry the peculiarity further. The dorsal blotches are perfectly distinct from each other and are truncate, and not narrowed at their inferior border. Very few of the scales have light centers, and there are no intermediate lateral spots. Belly spots sparse. In Cat. No. 8022 a wide longitudinal median black band forms, with the occipital spot, an anchor-shaped figure. This variety is approached nearly by the second and only other species of the genus, the *R. antonii* Dugès, which has the black crossbands fewer in number and wider. It is from Mazatlan. Individuals also differ in the relative size of the loreal plate and number of crossbars. In one from the Canadian River there are thirty-seven rings; in one from the Llano Estacado twenty-six. In another from the same locality the abdomen is black, tessellated; in all others, white.

The range of the *Rhinochilus lecontei* is throughout the Sonoran district. The most eastern and northern locality known for it is Garden City, in southwestern Kansas, where Professor Cragin, of Topeka, obtained a specimen. It presents the anomaly of having the loreal plate to enter the orbit below the preocular.

Mr. S. W. Garman¹ names a "var. *tessellatus*," with the sole description: "Labials, eight. Infralabials, ten. Ventrals, one hundred and seventy-eight. Subcaudals, thirty-seven entire, plus fourteen pair."

¹ Mem. Mus. Comp. Zool., VIII, 1883, p. 74.

The number of gastrosteges is smaller than in any specimen of the *R. lecontei* which I have seen. The locality is Coahuila, Mexico.

Rhinochilus lecontei Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2030	1	Fort Tejon, California.....		Dr. A. L. Heerman.....	Alcoholic.
2020	2	North Canadian River.....		Lieut. A. W. Whipple, U. S. A.	do.
5168	1	Fort Buchanan, Arizona.....		Dr. B. J. D. Irwin, U. S. A.	do.
2016	1	Fort Chadbourne, Texas.....		Dr. E. Swift, U. S. A.	do.
2031	2	Llano Estacado, Texas.....		Capt. John Pope, U. S. A.	do.
2023	1	Pecos River, Texas.....		Lieut. A. W. Whipple, U. S. A.	do.
4471	1	Fort Bliss, New Mexico.....		Dr. S. W. Crawford, U. S. A.	do.
8021	1	Camp Grant, Arizona.....		E. Palmer.....	do.
8022	1	Fort Whipple, Arizona.....		do.....	do.
8376	1	do.....	July 16, 1874	Dr. L. M. Taylor.....	do.
4472	1	Fort Tejon, California.....		John Xantus.....	do.
11743	4	Fresno, California.....	— —, 1879	Gustav Eisen.....	do.
11784	2	do.....	— —, 1879	do.....	do.
11746	5	do.....	— —, 1879	do.....	do.
15687	1	San Diego, Texas.....		W. Taylor.....	do.
16530	1	San Diego, California.....		C. H. Orcutt.....	do.
16829	1	Tucson, Arizona.....		Herbert Brown.....	do.
17394	1	Desdemonia, Texas.....		C. W. Richmond.....	do.
17441	1	Tucson, Arizona.....		Herbert Brown.....	do.
19259	1	do.....		do.....	do.
21110	}	Fort Huachuca, Arizona.....		Wilcox.....	do.
21111		do.....		do.....	do.
22203		Camp (Fort) Verde, Arizona.....		Loring.....	do.
17177		Nogales, Arizona.....		P. L. Jouy.....	do.
17825		Pinal Mountains, Southern Arizona.....		Herbert Brown.....	do.
22372		Mezulla Valley, New Mexico.		T. D. A. Cockerell.....	do.

I have also specimens from San Angelo, Texas, San Bernardino, California, and San Antonio, Texas.

Dr. Alfredo Dugès has described another species of this genus under the name of *R. antonii*.¹ It was found at Mazatlan. I have not included species from this region in the present work, as there is doubt as to whether it belongs to the Nearctic or Neotropical faunæ. I copy Dr. Dugès's figure for comparison in case the species may be found within our limits.

Bocourt has described a third species from Venezuela under the name of *R. thominotii*.

CONOPSIS Günther.

Conopsis GÜNTHER, Cat. Colubrine Snakes Brit. Mus., 1858, p. 6.—COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 52.

Ezorkina JAN, Arch. Zool. Anat. Phys., II, 1862, p. 61.

Teeth subequal, the last maxillary with a shallow external channel. No internal plates; rostral rather prominent; nasal undivided; loreal generally present; anal scute and

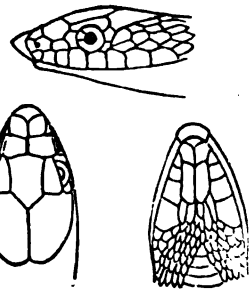


Fig. 237.

RHINOCHILUS ANTONII DUGÈS.

×½.

From Dugès.

¹ Proc. Amer. Phil. Soc., 1886, p. 290.

urosteges divided; pupil round; prefrontals in contact; labials distinct from nasal.

In this genus we have a reduction of the cephalic pholidosis in a type which has its extreme representative in the burrowing genus *Ficimia*. It stands in general features allied to some of the species of *Chionactis*, as the *C. episcopus*, and Boulenger unites it with his partly synonymous *Contia*. *Chionactis* has internasal plates, while they are absent in *Conopsis*, with anomalous exceptions. In *Contia* there are no grooved teeth. But one species of *Conopsis* is known.

CONOPSIS NASUS Günther.

Conopsis nasus GÜNTHER, Cat. Snakes Brit. Mus., 1858, p. 6.—PETERS, Mon. Berl. Ac., 1869, p. 875.—BOCOURT, Miss. Sci. Mex., Rept., 1883, p. 563, pl. xxxv, fig. 2.—GÜNTHER, Biol. Centr.-Amer., Rept., 1893, p. 97, pl. xxxiv, fig. B.

Oxyrhina (Exorhina) maculata JAN, Arch. Zool. Anat. Phys., II, 1862, p. 61; Icon. Gén. Ophid., 1876, Pt. 48, pl. II, figs. 2-4.

Conopsis maculatus BOCOURT, Miss. Sci. Mex., Rept., 1883, p. 564, pl. xxxv, fig. 3.

Ficimia nasus GARMAN, N. Amer. Rept., 1883, p. 83.

Ficimia maculata GARMAN, N. Amer. Rept., 1883, p. 84.

Contia nasus BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 268.

Seven subcephalic plates. No internasals. Loreal generally present. Upper surface of body olivaceous, spotted toward the front with black.

Head slightly convex in the prefrontal region. Rostral a little depressed and pointed at the extremity to form an angle when viewed in profile, but rounded transversely. Two well-developed prefrontals. Frontal hexagonal, longer than wide, having an obtuse angle in front and an acute one behind. The parietals rather wide, and relatively short. Seven supralabials, the third and fourth outlining the inferior border of the ocular disk. Nasal pierced in the middle and not in contact with the preocular, where the loreal is wanting or reaching it by an angle only. Loreal square. One preocular, two postoculars. Three temporals, the first a little larger than the two following. Two pairs of geneials, the second much shorter than the first, and separated from each other by a scutella. Six inferior labials, the first four in contact with the anterior geneial. Four or five pairs of gular scales, followed by 110-134 gastrosteges, of which the first two or three are rather narrow. Tail a little longer in the males than in the females, having on the under side 29-38 urosteges. Trunk scales convex behind, arranged in 17 median longitudinal series.

Measurements.—Total length of a male specimen, 266 mm.; length from the end of muzzle to anus, 217 mm.; length of tail, 49 mm.

Upper surfaces of the body olive yellow, spotted with small angular black marks, which are arranged in indistinct longitudinal lines. Below the eye, on the fourth supralabial, there is sometimes a blackish spot. The lower surfaces are yellowish white, with gray dots at the right and left of the ventrals and caudals.

This species is subject to variations consisting of the fusion or abortion of plates. The loreal plate is occasionally absent on one or both

sides, and rarely the postoculars may be fused, and two superior labials may be equally rarely fused. According to Günther and Boulenger the forms with internasal plates are only variations of this species, and the form of the rostral may vary from obtusely rounded to angulate, and to angulate with concave superior surfaces. That this incredible range of variations is characteristic of this species is sustained by the existence, according to these authors, of two individuals in the British Museum in which the internasal is present on one side and absent on the other. The great majority of specimens are, however, according to these authors, constant in these respects. Thus Boulenger enumerates thirteen individuals with internasals present on both sides and sixteen in which they are absent on both sides. Under such circumstances the irregularity in question would seem to be rather an anomaly than an indication that all the specimens belong to one species. This view is confirmed by ten specimens at my disposal which come under the definition of *Conopsis nasus* as given by Boulenger. Five, which I refer to the *C. nasus*, constantly lack internasals, and five which I refer to *Toluca lineata*, *Chionactis diasii*, and *Chionactis varians*, as constantly possess them. All possess loreals except the two individuals of *Toluca lineata*, where the nasal articulates with the preocular; and one side of two individuals of *Conopsis nasus*, where, on the contrary, the nasal terminates posteriorly in an acute angle, not reaching the preocular.

The small black dorsal spots are obsolete in four of the five specimens before me. These were sent me by M. Boucard, of Paris, without especial indication of locality.

Dugès gives as habitats of this species the valley of Mexico, Leon, Guanajuato, and Zacatecas.

CHIONACTIS Cope.

Chionactis COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 303; Check-list N. Amer. Batr. Rept., 1875, p. 35; Bull. U. S. Nat. Mus., No. 32, 1887, p. 53; Proc. U. S. Nat. Mus., XIV, 1892, p. 604.

Lamprosoma HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1856, p. 310; Reptiles Surv. U. S. Pac. R. R., X, 1859, Williamson's Report, p. 15.

Ogmia COPE, Proc. Amer. Phil. Soc., 1869, p. 162.—BOULENGER, Cat. Snakes Brit. Mus., 2d ed., III, 1896, p. 228.

Ozryhina JAN, Arch. Zool. Anat. Phys., II, 1862, p. 59; not of Agassiz.

Posterior maxillary tooth not enlarged, with a shallow external sulcus. Nasal plate single, pierced by the nostril, distinct from the labials. Internasals and preocular present. Anal and subcaudal plates double. Loreal usually present.

This genus tends to *Stenorhina*, from which it differs in the distinctness of the nasal plate from those adjacent, and more widely in the calyculate character of the hemipenis. From *Conopsis* it differs only in the presence of internasal plates. The last maxillary tooth is only moderately enlarged, and the groove is on the external face and is not

very deep. Hence it has been overlooked by various authors. It is this character which separates it from *Contia*, to which some of its species have been referred. The known species are found in the Sonoran and Toltecan subregions and in the adjacent parts of the Central American region. All are of small size. They differ as follows:

I. Scales in 13 rows.

Ventrals 126-137; urosteges 37-46; pale brown with faint longitudinal lines.

C. taylorii Boulenger.

II. Scales in 15 rows.

Gastrosteges 145-153; urosteges 35-57; pale brown, with or without darker cross-bands or faint lines..... *C. episcopus* Kennicott.

Gastrosteges 158; urosteges 34; rosy and white, with single black annulus or semiannulus; a black occipital crescent..... *C. occipitalis* Cope.

Gastrosteges 152-173; urosteges 37-45; red, with pairs of black cross-bands inclosing yellow ones..... *C. michoacanensis* Dugès.

III. Scales in 17 rows.

Occipital plates broad, regularly rounded; rostral prominent, convex above; pregenaeals short, in contact with three labials; belly spotted... *C. diasii* Cope.

Occipital plates longer, with undulate and emarginate posterior border; rostral concave above; pregenaeals longer, in contact with four labials; below unspotted..... *C. varians* Jan.

The shallowness and position of the groove of the last maxillary tooth in this genus does not entitle it to be placed in the Opisthoglypha. It may be perhaps in a condition from which the true groove of the opisthoglyphous tooth may have arisen.

CHIONACTIS TAYLORII Boulenger.

Contia taylorii BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 265, pl. XII, fig. 3.

Rostral broader than deep, the portion visible from above one-half to two-thirds as long as the distance from the frontal; nasal undivided; suture between the internasals as long as or shorter than that between the prefrontals; frontal about once and a half as long as broad, broader than the supraocular, longer than its distance from the end of the snout, a little shorter than the parietals; loreal small, longer than deep; one preocular and two postoculars; temporals 1 + 1 or 1 + 2; seven upper labials, third and fourth entering the eye; three or four lower labials in contact with the anterior chin shields; posterior chin shields very small and separated from each other. Scales in 13 rows. Ventrals 126-137; anal divided; subcaudals 37-46. Pale brown above, each scale darker along the center; upper lip and lower parts white.

Measurements.—Total length, 270 mm.; tail, 55 mm.

Texas, probably the southwest (San Diego, Duval County).

I have not seen this species, but the small number of scales and gastrosteges indicate its distinctness. Judging from Boulenger's figure, it closely resembles the *C. episcopus episcopus*.

CHIONACTIS EPISCOPUS Kennicott.

Contia episcopa COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 251; Check-list N. Amer. Batr. Rept., 1875, p. 36; Bull. U. S. Nat. Mus., No. 20, 1880, p. 20.—GARMAN, N. Amer. Rept., 1883, p. 94, pl. vi, fig. 2.—COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 600.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 265.

Lamprosoma episcopum KENNICOTT, U. S. Mex. Bound. Surv., II, 1859, p. 22, pl. VIII, fig. 2.

Homalosoma episcopum JAN, Arch. Zool. Anat. Phys., II, 1862, p. 35; Icon. Gén. Ophid., 1865, Pt. 13, pl. iv, fig. 2.

Scales in fifteen rows, all smooth; superior labials, seven; the orbit bounded by the third and more largely by the fourth; loreal, small, quadrangular, longer than high; oculars, 1-2 anterior short, covered above by superciliary; postoculars resting on fourth labial; fifth and sixth labials equal, as high as long; parietals, large, long; frontal, longer than wide; prefrontals, transverse. Internasals partly separated by rostral, which is not very prominent. Inferior labials, six; first pair meeting; fourth largest. Postgenaeals extremely short. Temporals little larger than body scales, 1-2. Muzzle obtuse; head scarcely distinct; eye small. Gastrosteges, one hundred and sixty-three; anal 1-1; urosteges varying in Texan specimens from thirty-five to forty-five.

There are three well-marked color varieties, which pass into each other. They are as follows:

Ground color ashen to rosy, with the scales broadly tipped with brown. A few only of the median rows of dorsal scales may be red, and the top of the head may or may not be brown *C. e. episcopus*.

Ground color light yellow tinged with brown above; three median dorsal rows orange. Top of head, from anterior border of frontal to near end of occipitals, black. A transverse black spot beginning on the fourth scale behind the occipitals, two scales long and including the fourth row of scales from the gastrosteges on each side *C. e. torquatus*.

Ground color is ashy or red. The back is traversed by from nineteen to twenty-one black cross-bands of three and a half scales in length; there are six on the tail. Belly uniform *C. e. isozonus*.

These subspecies pass into each other by distinct gradations, although the intermediate forms are less abundant than the types.

This is a characteristic species of western Texas. It is common west of Fort Worth to Fort Concho and about Helotes in the south. It exhibits a great range of color variation, since it is evident that the *C. isozonus* must be reckoned as one of its varieties. Thus its range extends to Utah and Arizona.

CHIONACTIS EPISCOPUS EPISCOPUS Kennicott.

Contia episcopa episcopa COPE, Bull. U. S. Nat. Mus., No. 17, 1880, p. 21.

Lamprosoma episcopum KENNICOTT, U. S. Mex. Bound. Surv., II, Reptiles, 1859, p. 22, pl. VIII, fig. 2.

Homalosoma episcopum JAN, Icon. Gén. Ophid., Pt. 13, pl. IV, fig. 2.

Form rather stout, tapering very little toward the neck, which is not much narrower than the head, and moderately tapering toward the tail. The tail forms about one-fifth of the total length. Head rather depressed; crown flattened posteriorly. Snout broad, rounded, and depressed. Frontal a third longer than wide; scarcely tapering behind; acute posteriorly, and usually slightly concave on the sides. Superciliaries and parietals short and narrow. Nasal elongated; nostril very

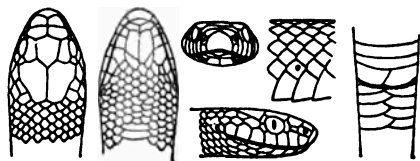


Fig. 238

CHIONACTIS EPISCOPUS EPISCOPUS KENNICOTT.

× 1.5.

Wichita River, Texas.

Collection of E. D. Cope.

small in the center of the plate. Loreal elongated; not half as large as the anteorbital, which is itself small and vertically elongated. Postorbitals of nearly equal size. Temporals, 1-2. Rostral subpentagonal; the apex acute and turned back upon the crown, entering slightly between the prefrontals. Seven upper labials; fourth, fifth, and sixth

largest and nearly equal in size, seventh very small. Lower labials seven; the fourth very much the largest. The dorsal scales in fifteen rows; they increase regularly in size from the central rows, which are much the smallest, to the first lateral row, which is higher than long. The color of the entire upper parts of head and body is uniform light olive brown tinged with green, but on close inspection each scale is seen to be very minutely mottled with black toward the center, and upon stretching the skin the base of each scale is black. A rose-colored vertebral stripe in life. The abdomen is uniform whitish green. In a specimen from Rio Seco the exposed base of each scale is black, giving the body somewhat of an indistinctly mottled appearance even when the skin is not stretched. The colors become lighter after soaking long in alcohol, and the black at the bases of the scales becomes more or less effaced.

Cat. No. 2042; upper labials, 7; rows of scales, 15.

Chionactis episcopus episcopus Kennicott.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2042	1	Eagle Pass, Texas	A. Schott	Alcoholic.
2044	1	Indianola, Texas	Capt. John Pope, U. S. A.	do.
2053	1	Llano Estacado, Texas	do	do.
15668	1	San Diego, Texas	W. Taylor	do.
17393	1	Eastland, Texas	Hasbrouck	do.
19470	.....	Mexican Boundary Line.....	Mearns	do.

I have also numerous specimens from West Texas from between Fort Worth and Fort Couch on the north to San Antonio on the south. Twelve of these are from the Wichita River and were collected by Jacob Boll. Of these, seven are normal, three have no loreal on one side, and one has no loreal on both sides; one has two temporals of the anterior row instead of one. A specimen from a more western locality, San Angelo, Texas, is anomalous in having no loreals, and in having the two postoculars fused into one on both sides.

CHIONACTIS EPISCOPUS TORQUATUS Cope.

Contia episcopa torquata COPE, Bull. U. S. Nat. Mus., No. 20, 1880, p. 21.

Contia torquata BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 266.

Light yellowish brown above, with a median undefined orange band. Top of head from anterior part of frontal plate to near posterior border of parietals black. A black half collar behind the parietal plates extending to the third row of scales on each side, exclusive.

In one specimen the third and fourth rows of scales black at their bases, forming a double lateral stripe, extending from the end of the half collar to beyond the middle of the body. In a second specimen these lines are absent. Lips and below, immaculate. Gastrosteges one hundred and forty-three; anal divided; urosteges thirty-eight.

I have but two specimens of this variety, of which one is known to be from northwestern Texas, and the other of uncertain locality, but probably from the same region. In the smaller, the third superior labial is almost excluded from the orbit; in the latter it has the usual share. In the latter also the top of the head is brown, as is often the case in the usual variety.

Boulenger has regarded this species as distinct in consequence of my ascription of 183 gastrosteges to it. This number, which appears in my original description, is a typographical error for 143.

CHIONACTIS EPISCOPUS ISOZONUS Cope.

Contia episcopa torquata COPE, Bull. U. S. Nat. Mus., No. 20, 1880, p. 21; Amer. Nat., XXX, 1890, p. 1015.

Contia isozona COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 304.—Report U. S. Geog. Surv. W. of 100th Mer., V, p. 537, pl. XVIII, figs. 1, 1a.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 266.

Two postoculars; six rows of gular scales. Rostral rounded, slightly produced backwards. Senta 158†, 52. Twenty black half rings, separated by equal spaces of pinkish ground color.

Eye small, diameter twice in length of muzzle. Preorbital narrower above, not extending above lower margin of superciliary; loreal twice as long as high. Prefrontals and internasals much broader than long; frontal slightly angulate in front, longer than broad; parietals rather elongate, subtruncate behind. Postorbitals subquadrate, temporals 1-2. Postgenaeals minute. Superior labials seven, all higher than long, eye over third and fourth. Scales in fifteen rows, all broader than long. Tail four and two-fifths times in total length, which is 10.25 inches. Below immaculate; tail completely six-annulate.

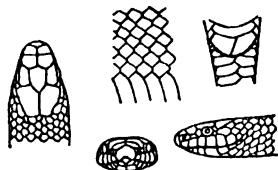


Fig. 239.

CHIONACTIS EPISCOPIUS ISOZONUS
COPE.

× 1.5.

Fort Whipple, Arizona.

Cat. No. 11417, U.S.N.M.

Another specimen in the U. S. National Museum from Rockville, Kane County, Utah, from Mr. A. L. Siler, indicates a variety. The body is longer than in the type, and is crossed by twenty-five black bars between these, and on top of muzzle vermilion, below yellow. Scuta 167 $\frac{1}{2}$, 52. In two specimens the top of the head is black; in another it is like the general ground color. In the same specimen the dorsal bars are very faint.

Cat. No. 11417; upper labials, 7; gastrosteges, 167 + 1; urosteges, 52; rows of scales, 15.

Urosteges in other specimens, fifty-one, fifty-two, fifty-three.

I have a specimen from Prof. W. T. Cummins from the Tule Canyon in the Staked Plain of Texas.

I suspect that the *Sonora semiannulata* of Baird and Girard was established on an abnormal specimen of this species. That specimen is remarkable in having the superciliary plate divided symmetrically on each side by a suture, which cuts off a plate whose apex reaches the parietal, and which Baird and Girard term a third postocular. The muzzle was somewhat wrinkled, so as to produce folds of the integument. This led to the mistaken belief that the nasal is divided. Omitting these two characters, there remains only a slightly more protuberant rostral plate, which is not more, in my opinion, than an individual peculiarity. The coloration is identical with that of the *C. e. isozonus*. More specimens will be necessary to settle the question definitely. Should the identification here suggested prove necessary, the name of the species will stand as *Chionactis semiannulatus*, with the subspecies *episcopus*, *torquatus*, and *semiannulatus*.

This form is further variable. In Cat. No. 14096 the number of gastrosteges and urosteges is less than in the *C. e. isozonus*; the nasal and loreal plates are of different shapes, and the rostral is more prominent. The color is also different. Otherwise the plate and scale forms are the same.

The rostral is narrower when viewed from above, and is more produced both forward and backward. The nasal is produced backward

to a narrow but obtuse angle. Loreal minute, with an acute apex forward. First temporal longer than deep; it is as deep as long in *C. e. isozonus*. Gastrosteges, one hundred and forty-four; urosteges, forty; the latter vary from fifty to fifty-three in the *C. e. isozonus*. The ground color is similar to that of the *C. episcopus*, and there are black crossbars which are less numerous and narrower than in the *C. e. isozonus*. There are twenty-two on the body and some obsolete specks on the tail. Lower surfaces everywhere immaculate. The crossbars appear as spots on the fourth and fifth rows of scales, and are better defined between these rows, and are one and a half to two scales wide. In *C. e. isozonus* the black bands are three and four scales wide and are equidistant, and those of the tail are distinct on both superior and inferior surfaces.

Measurements.—Total length, 238 mm.; tail, 41 mm.

Chionactis episcopus isozonus Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2109	1	Sonora, Mexico		Col. J. D. Graham, U. S. A.	Alcoholic.
8179	2	Utah		Exp. W. of 100th M.	Alcoholic type.
11417	1	Fort Whipple, Arizona	— —, 1865	Dr. E. Coues, U. S. A.	Alcoholic.
8601	1	Fort Mohave, Arizona		Dr. O. Loew	do.
7	1	Utah		A. L. Siler	Alcoholic type.
14813	1	Fort Verde, Arizona		Dr. E. A. Mearns	Alcoholic.
15530	1	.....		.....	do.
15703	1	Prescott, Arizona		W. L. Carpenter	do.
15715	1	do		do	do.
19352	.....	Mexican boundary line		Dr. E. A. Mearns	do.
Catalogue No.	Number of specimens.	Locality.	From whom received.		
14096	1	Gainesville, Texas	G. H. Ragsdale.		

CHIONACTIS OCCIPITALIS Hallowell.

Chionactis occipitale COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 310; Proc. U. S. Nat. Mus., XIV, 1892, p. 605.

Rhinostoma occipitale HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1854, p. 95.

Lamprosoma occipitale HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1856, p. 310.—BAIRD, U. S. Mex. Bound. Survey, 1859, p. 21, pl. XXI, fig. 1.

Contra occipitalis BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 266.

Head small, of same breadth posteriorly as neck, depressed in front; snout rounded; rostral plate large, excavated below, presenting a triangular shape above and in front, where it forms the extremity of the muzzle; internasals smaller than the prefrontals, their inner margins much shorter than their external, which are in contact with the upper margins of the nasal plates; the prefrontals are more or less pentangular in shape, the posterior margin of each in contact with the anterior margin of the anteorcular, the supraocular, and the half of the frontal

plate, its external margin with the upper margin of the frenal; the frontal plate is about as broad as long, narrower posteriorly, but less so than in *Cemophora coccinea*; supraoculars broader posteriorly; occipitals of moderate size, pentangular; nostril large, deeply excavated, in nearly the center of a large and conspicuous nasal plate, somewhat pyriform; a long and very narrow frenal, lying between the second and third supralabials and the prefrontal; but one preocular, which is quadrangular, resting on the third supralabial; two postoculars, the

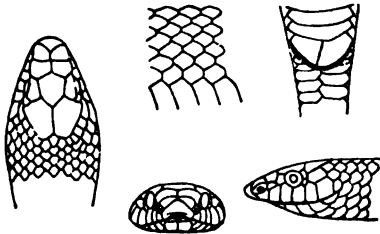


Fig. 240.

CHIONACTIS OCCIPITALIS HALLOWELL.

× 1.5.

Colorado Desert, Colorado.

Cat. No. 2105, U.S.N.M.

upper much larger than those which follow; the eye in contact inferiorly with the third and fourth; body long and slender, depressed; scales, of which there are fifteen rows, quadrangular, smooth, and shining, their posterior margins rounded, the three inferior rows larger than the others; gastrosteges appearing to a slight extent upon the flanks; tail short, with a somewhat blunt extremity.

Milk-white above, with thirty-four transverse black bands, including one upon the posterior part of the

head; six complete rings of black upon the tail, and one incomplete just behind the anus; jaws, chin, throat, and abdomen white; interspaces between rings upon under part of tail white.

Cat. No. 8030; upper labials, 7; gastrosteges, 158 + 1; urosteges, 34; total length, 323 mm.; length of tail, 53 mm.

A variety of this species was described by Kennicott under the name of *C. o. annulatus*,¹ based on two specimens from the Colorado Desert. They differ from the type only in the continuance of the black cross-bands across the abdomen, forming complete rings.

Cat. No. 2105; upper labials, 7; gastrosteges, 172; urosteges, 43; rows of scales, 15; total length, 350 mm.; length of tail, 64 mm.

The color of the specimens of this species, which is light in alcohol, is in life yellow, with some pink intermixed, forming a handsome combination of colors.

Chionactis occipitalis occipitalis Hallowell.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8030	1	Camp Mojave, Arizona ...	June —, 1877	Dr. J. G. Cooper	Alcoholic.

¹ Proc. Acad. Nat. Sci. Phila., 1856, p. 310.

Chionactis occipitalis annulatus Kennicott.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2105	2	Colorado Desert, Colorado.	.....	A. Schott.....	Alcoholic.
2495	.....	Chrysotol, Yuma County, Arizona.	.....	R. J. Young.....	.....
22574	.....	Colorado Desert, Colorado.	.....	C. R. Orcutt.....	.....

CHIONACTIS DIASII Cope.

Chionactis diasii COPE, Proc. U. S. Nat. Mus., 1886, p. 188.

Conopsis lineatus BOCOURT, Miss. Sci. Mexique, Reptiles, p. 565, pl. xxv, fig. 4; from *Toluca lineata* Kennicott; not of Kennicott.

Ogmis acutus COPE, Proc. U. S. Nat. Mus., 1886, p. 189.—BOULENGER, Cat. Snakes Brit. Mus., III, 1896, p. 229.

Conopsis nasus GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 6.

Contia nasus BOULENGER, part, Cat. Snakes Brit. Mus., II, 1894, p. 268.

Cephalic scutes normal; nostral prominent, not concave above, angulate viewed in profile; angulate or rounded from above; as long as the common suture of the prefrontals or prefrontal and internasals combined. Nostril pierced in front of middle of nasal plate, which is truncate posteriorly, joining the square loreal. Oculars, 1-2; temporals, 1-2. Frontal openly angulate in front, acutely angulate posteriorly. Occipitals nearly as wide as long, with regular external and posterior borders, not emarginate at median junction. Superior labials seven, all higher than long, third and fourth below orbit. Pregeneials short in contact with only three labials; fourth inferior labial largest and in contact with the very short postgeneial. Gastrosteges, 121-127; urosteges, 32-37. Brown, variously marked above and below with darker; head unicolor.

This species embraces two well-marked subspecies, which differ as follows:

Rostral transversely rounded, its superior surface as long as the common suture of the prefrontals; color in longitudinal stripes or series of small spots. *C. d. diasii* Cope.

Rostral acute viewed from above; its length equal length of common suture of prefrontals and internasals; color above in numerous dark cross-bands.

C. d. acutus Cope.

CHIONACTIS DIASII DIASII Cope.

Chionactis diasii COPE, Proc. U. S. Nat. Mus., 1886, p. 188.

Conopsis lineatus BOCOURT, Miss. Sci. Mexique, Reptiles, p. 565, pl. xxv, fig. 4.

Conopsis nasus GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 6.

Contia nasus BOULENGER, part, Cat. Snakes Brit. Mus., II, 1894, p. 268.

The *C. diasii acutus* has been found so far only in the Tierra Caliente at Juchitan, at the western part of the Isthmus of Tehuantepec, by F. Sumichrast.

CHIONACTIS VARIANS Jan.

Chionactis varians COPE, Proc. U. S. Nat. Mus., IX, 1886, p. 189; Bull. U. S. Nat. Mus., No. 32, 1887, p. 82.

Oxyrhina varians JAN, Arch. Zool. Phys., II, 1862, p. 60.

Conopsis varians BOCOURT, Miss. Sci. Mex., Rept., p. 566, pl. xxxv, fig. 5.—DUGÈS, La Naturaleza (2), 1888, p. 123.

Conopsis nasus GÜNTHER, part, Biolog. Centr.-Amer., 1893, p. 97, pl. xxxiv, fig. B.

Head slightly wider than neck. Rostral plate prominent, angulate in profile, rounded from above, superior surface with a small concavity, and equal to two-thirds the length of the distance to the frontal plate. Occipitals longer than frontal, lateral borders concave posteriorly, and emarginate at the point of junction behind. Nostril pierced anterior to middle of nasal plate, which is truncate posteriorly and in contact with the subquadrate loreal. Oculars 1-2; temporals 1-2; three temporals bounding the occipitals larger than nuchal scales. Superior labials seven, all higher than long. Pregeneials rather elongate, bordered by four inferior labials, of which the fourth is the largest of the series. Postgeneials very small, separated by a scale. Gastrosteges one hundred and thirty-six; urosteges, thirty.

Measurements.—Total length, 272 mm.; length of tail, 39 mm.; length to canthus oris (axial), 10 mm.

Ground color above brown, with small spots longitudinally arranged; below yellowish unspotted. In the specimen in the national collection there is a series of small, brown, light-edged spots on the middle dorsal line, which cover the halves or wholes of two scales both transversely and longitudinally. On each side of these is a more indistinct smaller dark-brown spot which may be confluent with them; and further laterally there are traces of another series of spots. The brown ground color is produced by a dense speckling or reticulation of deep brown on a lighter ground, and these fine markings cover the cephalic scutes, and extend to the extremities of the gastrosteges. According to Bocourt there are sometimes three very indistinct longitudinal stripes.

This species is well distinguished from the other members of the genus by the form of its occipital plates, and by the longer pregeneials. The same characters distinguish it from the *Conopsis nasus*. The coloration is also characteristic. The form of the occipital shields is only partially displayed in Bocourt's figure, as cited, and none of my specimens of the *C. nasus* have even the small posterior emargination shown in Bocourt's figure of that species. In the regular rotundity of the outline of the occipitals the *Conopsis nasus* agrees with the species of *Chionactis* excepting *C. varians*.

Chionactis varians Jan.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
113	1	(1)	F. Sumichrast	Alcoholic.

Dr. Dugès enumerates this species as found in the Valley of Mexico and Guanajuato.

PSEUDOFICIMIA Bocourt.

Pseudoficimia BOCOURT, Miss. Sci. Mexique, Reptiles, 1883, p. 572.

Grooving of posterior maxillary teeth obsolete. Nasal plate divided below the nostril, which is below the internasal suture. Internasal plates present; rostral prominent. Anal and subcaudals divided. Pupil round.

This genus is nearly allied to *Chionactis*, but the teeth can not be said to be grooved, and the nasal is partly divided. For these reasons I formerly referred the typical species *P. frontalis* to *Geagras*, but Dr. Boulenger points out that that genus is characterized by the position of the nostril at the junction of the nasals and internasal, which is not the case in this species. But one species of this genus is known.

PSEUDOFICIMIA FRONTALIS Cope.

Pseudoficimia frontalis GÜNTHER, Biol. Centr.-Amer., Rept., 1893, p. 96.

Toluca frontalis COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 167.

Ficimia olivacea PETERS, part, Monatsb. Berl. Acad., 1869, p. 875.

Pseudoficimia pulchra BOCOURT, Miss. Sci. Mex., Rept., 1883, p. 572, pl. xxxv, fig. 12.

Ficimia frontalis GARMAN, N. Amer. Rept., 1883, p. 82.

Geagras frontalis COPE, Amer. Nat., 1884, p. 163.

Contia frontalis BOULENGER, Cat. Snakes Brit. Mus., 2d ed., II, 1894, p. 270.

Muzzle prominent, acuminate, slightly recurved. Rostral separating prefrontals very slightly. Nasal long, divided below the nostril; no loreal; postfrontal in contact with second superior labial. One narrow low preocular, two postoculars, the lower barely in contact with one temporal; temporals 1-2-3. Seven superior labials; eye over third and fourth. Occipitals longer than frontal, truncate, rounded behind; anterior suture of frontal a little longer than straight, lateral. Seventeen rows of equal thin scales. Seven inferior labials; geneials very short, posterior pair reduced to scales. Urosteges, forty-four; one double anal; gastrosteges, one hundred and forty-one.

Measurements.—End of muzzle to canthus oris, 15 mm.; to vent, 406 mm.; length of tail, 96 mm.; total, 502 mm.

Color below uniform pale yellow; above grayish brown, becoming more rufous medially, with about thirty-six rhombic, dark-edged brown spots, six scales wide and four long, whose angles are produced as vertical lateral bars. Together they become nearly crossbands posteriorly, when they are separated by a pale spot on the vertebral line. A brown cross-band across prefrontals and frontal; a longitudinal band on each occipital and side of nape.

This is one of the species which range from the Sierra Caliente at Colima to the Austroccidental plateau at Guadalajara.

Pseudocioimia frontalis Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1263 †	2 1	Colima, Mexico..... Guadalajara, Mexico.....	John Xantus J. J. Major	Alcoholic. do.

TOLUCA Kennicott.

Toluca KENNICOTT, U. S. and Mex. Bound. Surv., Reptiles, II, 1859, p. 23.—COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 241; Bull. U. S. Nat. Mus., No. 32, 1887, p. 82.

Achirina JAN, Arch. p. la. Zoolog. Modena, 1862, p. 61.

Cephalic shields normal, except that the frontal is produced between the prefrontals as far as the internasals. Nasal single; loreal wanting. Anal and urosteges divided.

TOLUCA LINEATA Kennicott.

Toluca lineata KENNICOTT, U. S. and Mex. Bound. Surv., 1859, p. 23, pl. XXI, fig. 2.—COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 241.

Size small, body stout, subcylindrical, deeper than wide. Tail short and thick. Head short and broad, wedge shaped, almost continuous with the body. Snout much depressed, acutely pointed, and projecting beyond the lower jaw. Crown arched throughout. Cephalic plates normal. Frontal very large, subhexagonal, the anterior extremity elongated in a narrow process to the internasals, thus widely separating the prefrontals. Occipitals shorter than frontal, nearly as broad as long. Superciliaries small. Rostral proportionally large, turned back upon the crown, the apex obtusely pointed, and its center forming the acute point of the nose, not concave above. Nasal pentagonal, much elongated, pointed posteriorly. No loreal. One small subpentagonal anteorbital, as long as high; two postorbitals, upper slightly largest; seven upper labials, all higher than long, first much smaller than the second and succeeding rows; lower labials, six. Temporals, 1-2.

Dorsal scales in seventeen rows, smooth. The scales of the first lateral rows are higher than long; those of the central rows narrower, the outer row largest. Postabdominal scutella divided; subcaudal all divided. Color above uniform light brownish ash, with three imperfect longitudinal blackish stripes, each on a single row of scales.

Besides the typical specimen I obtained a second from the Valley of Toluca, which agrees with it in all respects. I am not therefore inclined to agree with Boulenger that the characters it presents are anomalous, and that it is a form of *Conopsis nasus*. Besides the four plates in front of the frontal, and the postfrontals separated by the frontal, the coloration is also characteristic. The *Conopsis lineatus* of Bocourt is a different species in my estimation, and, owing to the presence of two pairs of regular plates on the muzzle, and a loreal, referable to the genus *Ogmis*.

Toluca lineata Kennicott.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2108	1	Valley of Mexico	J. Potts /	Alcoholic.

GYALOPIUM Cope.

Gyalopium COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 243; Proc. U. S. Nat. Mus., XIV, 1892, p. 603; Bull. U. S. Nat. Mus., No. 32, p. 52.

Form stout, tail short. Head slightly distinct, large, depressed. Rostral plate acute, its anterior border elevated, its upper surface concave. It is produced backward, separating the internasals and prefrontals. Internasals present, prefrontals one pair. Nasal confounded with the first labial, a groove from the nostril to the suture of the second labial. No loreal; its place is supplied by the prefrontal. One preocular. Postgenaeals rudimental. Scales smooth, anal and subcaudal scutellæ divided. Teeth small, of equal lengths. Pupil round.

This genus introduces us to a type which is especially Mexican, and which includes the genera *Ficimia* Gray, *Ogmis* Cope, and *Conopsis* Günther. *Stenorhina* Duméril and Bibron is probably so allied, as well as perhaps *Geagras* Cope. They all have protuberant rostral shields, which are in the first three genera named more or less recurved. Besides the *G. canum*, there is but one species of *Gyalopium*, the *G. publium* Cope,¹ which has been found in Yucatan.

Rostral plate reaching frontal; 17 rows of scales; seven labials; quadrate brown dorsal spots; larger *G. publium* Cope.
 Rostral not reaching frontal; 17 rows of scales; seven superior labials; transverse brown bands; smaller *G. canum* Cope.

GYALOPIUM CANUM Cope.

Gyalopium canum COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 243.—COUES, U. S. Geog. Expl. Surv. W. of 100th Mer., V, p. 624, pl. xviii, figs. 2, 2a.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 36.

Form stout; tail one-eighth of total length. Head slightly distinct, large, depressed. Rostral plate acute; its anterior border elevated; its upper surface concave. It is produced backward, separating the prefrontals, not reaching the vertical. Frontals two pairs. Nasal confounded with the first labial, a groove from the nostril to the suture of the second labial. No loreal, its place supplied by the postfrontal. One preocular, two postoculars. Scales smooth; anal and subcaudal scutellæ divided. Teeth small, of equal lengths. Pupils round.

Prefrontals triangular, not larger than preoculars. Postoculars of equal size. Anterior border of vertical not angulated. Occipitals as broad as long, truncate posteriorly. Superior labials seven, eye over

¹ Proc. Acad. Nat. Sci. Phila., 1866, p. 126. *Ficimia ornata* Bocourt. Mission Scientif. de Mexique, p. 571, pl. xxv, fig. 10.

third and fourth. Inferior labials seven, fourth largest. Geneials one pair, very short. Scales in seventeen longitudinal rows, nearly square. Gastrosteges one hundred and thirty, one anal; urosteges twenty-eight.

Measurements.—Total length, 188 mm.; tail, 23 mm.

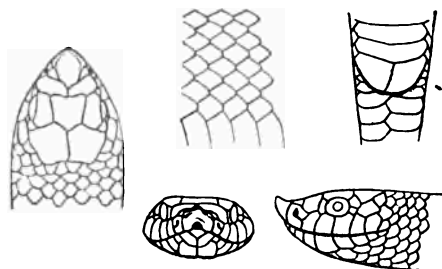


Fig. 241.
GYALOPIUM CANUM COPE.
× 1.3.

Southern Arizona.

Cat. No. 8879, U.S.N.M.

Color above brownish gray, crossed by thirty-one irregular transverse brown bands. These are from one to three scales wide on the back and extend to the gastrosteges. Anteriorly they exhibit a tendency to divide into a dorsal and two lateral series of spots. Eight transverse spots on the tail. First spot on the neck large, produced medially to the occipitals. A brown band extends from one angle of the mouth to the other across the occipitals, involving the tip of

the vertical. Another brown band begins upon the upper borders of the lower labial shields, passes through the eye, and crosses the anterior part of superciliaries and vertical and posterior parts of postfrontals and rostral. Dirty yellow beneath and upon the first row of scales. This serpent resembles at first sight a diminutive *Heterodon*.

Gyalopium canum Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8879	1	Southern Arizona	—, 1873	H. W. Henshaw	Alcoholic.
5284	1	Fort Buchanan, Arizona		Dr. B. J. D. Irwin, U.S.A.	do.

CHILOMENISCUS Cope.

Chilomeniscus COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 339; 1861, p. 302; Proc.

U. S. Nat. Mus., XIV, 1892, p. 593.—BOULENGER, Cat. Snakes Brit. Mus.,

II, 1894, p. 272; Bull. U. S. Nat. Mus., No. 32, 1881, p. 53.

Ergenia STEINDACHNER, Voyage of the Novara, V, 1876, p. 92.

Form stout, body cylindrical, the head not distinct. Muzzle rounded, very prominent, and much depressed. Rostral plate large, with an extensive superior surface, and presenting an obtuse angle between the prefrontals; the inferior surface greater than the superior, owing to the backward position of the mandible. Head shields broad, normal, except in the confluence of the prefrontals with the nasals. Loreal none. One preocular, two post oculars. Scales smooth. Tail short, the urosteges and anal plate divided. Teeth equal, or the posterior a little stouter. Palatine and pterygoid teeth present.

This genus of burrowing snakes is analogous to *Stenorhina* in the union of the nasal and prefrontal shields. The form of the muzzle and inferior position of the mouth indicate affinity to *Chionactis*.

There are three species, which differ as follows:

I. Rostral plates not separating internasals.

Postnasal not reaching preocular; two or three inferior labials reaching pre-geneials; light, each scale with a black point. *C. stramineus* Cope.

II. Rostral plates separating internasals.

Postnasals touching or approaching preocular; three labials reaching pre-geneials; cross-banded. *C. ephippicus* Cope.

Postnasal well removed from preocular; four or five labials reaching pre-geneials; cross-banded. *C. fasciatus* Cope.

CHILOMENISCUS STRAMINEUS Cope.

Chilomeniscus stramineus COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 339; Checklist N. Amer. Batr. Rept., 1875, p. 35; Proc. U. S. Nat. Mus., XIV, 1892, p. 594.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 273.

Chilomeniscus cinctus COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 303.

Carphophis straminea GARMAN, N. Amer. Rept., 1883, p. 99.

Carphophis cincta GARMAN, N. Amer. Rept., 1883, p. 100.

Scales in thirteen rows, all wide and obtuse, four rows on each side, wider than long. Rostral plate extensively recurved on the superior surface of the muzzle, its posterior border, presenting an obtuse angle, which does not reach the prefrontals. Internasals and prefrontal median suture short; frontal wide, but not as wide as long, angulate in front, more strongly angulate behind. Each parietal but little if any larger than the frontal.

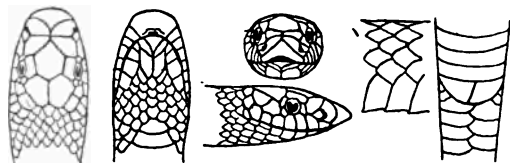


Fig. 242.

CHILOMENISCUS STRAMINEUS COPE.

× 1.3.

Cape St. Lucas, Lower California.

Cat. No. 4674, U.S.N.M.

Prefrontal in considerable contact with second superior labial. Seven superior labials all longer than high, except the first. Temporals 1-1, both deeper than long. Eyes and superciliary plates very small. Tail short and conical.

Common suture of the prefrontals but half the length of their sutures with the frontal. Vertical presenting an obtuse angle anteriorly; the superciliary sutures converging posteriorly; posterior angle less than a right angle. Parietals short, their common suture scarcely longer than the prefrontal suture of the frontal. Superior labials seven, the second reaching the minute preocular, or should that plate be absent, as will probably occur occasionally, forming with the third and fourth the inferior border of the orbit. Inferior labials eight, fifth the largest. Geneials two pairs, posterior half the length of the anterior. Temporals 3-3; a larger central plate opposite the occipital suture. Scales

in thirteen rows, hexagonal on the flanks, a little elongated on the back. Gastrosteges, one hundred and seventeen; one divided anal; urosteges, twenty-two.

Measurements.—Total length of the largest specimen, 272 mm.; the tail, 35 mm.

Color inferiorly and upon the first and second rows of dorsal scales pale straw color. Superiorly, brownish straw color, each scale with a deep brown dot near its posterior extremity. Top of the head grayish, minutely punctulated with darker.

Cat. No. 4674; upper labials, 7; gastrosteges, 117 + 1; urosteges, 22; rows of scales, 13; total length, 272 mm.; tail, 35 mm.

Chilomeniscus stramineus Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
6496	3	Cape St. Lucas, L. California.	.....	J. Xantus.....	Alcoholic type.
4674	2	do.....	.....	.....do.....	do.
5596	4	San Marthe.....	.....	Paris Museum.....	do.
12629	2	La Paz, L. California.....	Feb.—, 1882	L. Belding.....	do.

The habitat of this species is the region about Cape St. Lucas, Lower California.

CHILOMENISCUS EPHIPPICUS Cope.

Chilomeniscus ephippicus COPE, Proc. Acad. Nat. Sci. Phila., 1875, p. 85.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 35.—COUES, Wheeler's Rep. Expl. Surv. W. 100th Mer., V, 1875, p. 625, pl. XVIII, fig. 3.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 273.

Scales broad, in thirteen rows; tail about one-seventh total length. Rostral plate large, entirely separating internasals, not encroaching

on prefrontals; nasal plate separating prefrontals and labials, in contact with preocular. Superciliaries very narrow; occipitals broad as long. Temporals 1-1, large; labials above, seven, third and fourth in orbit; these with second, narrow, erect; first longitudinal; fifth and sixth smaller than the others; seventh suddenly larger. Inferior labials

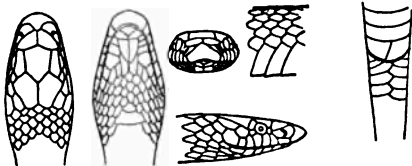


Fig. 243.

CHILOMENISCUS EPHIPPICUS COPE.

× 1.3.

Arizona Valley, California.

Cat. No. 8897, U.S.N.M.

eight; first pair in contact before pregenaeals; postgenaeals very small.

Measurements.—Total length, 137 mm. Gastrosteges, 113, separated from geneals by four rows of gulars; anal 1-1; urosteges, 28-28. Above reddish or yellowish, with twenty-one black crossbars to vent, which are broader than interspaces, and do not quite reach gastrosteges; five nearly complete rings on tail. Belly white. From occipitals to anterior

part frontal with the labials opposite this part (except their lower edges) black.

This species is somewhat similar to the *C. stramineus cinctus* Cope, but differs in the posterior production of the postnasal plate to the preocular, so as to prevent the junction of the prefrontals and labials.

In the Tucson specimens the dorsal spots invade the first row of scales as in the type.

Cat. No. 8897; upper labials, 7; gastrosteges, 113 + 1; urosteges, 28; rows of scales, 13; total length, 120 mm.; tail, 16 mm.

Chilomeniscus ephippicus Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
8897	2	Arizona Valley, California..	G. H. Horn, M. D.....	Alcoholic.
15788	3	Tucson, Arizona.....	Herbert Brown.....	do.
15789				
15790				
16806	1	do.....	P. L. Jony.....	do.
21539	1	San Fernando, Lower California.	A. W. Anthony.....	do.

Of three specimens from Tucson, Arizona, Cat. No. 15788, the largest, has the postnasal separate from the preocular, although not far removed; in Cat. No. 15789, a much smaller specimen, the arrangement is the same, while in Cat. No. 15790, which agrees with Cat. No. 15789 in dimensions, the posterior angle reaches the preocular as in the type. In the type of *C. fasciatus* the two plates are more widely separated than in Cat. No. 15789.

CHILOMENISCUS FASCIATUS Cope.

Chilomeniscus stramineus fasciatus COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 595.

Chilomeniscus cinctus COPE, YARROW, Check-list N. Amer. Batr. Rept., 1883, p. 86; not of Cope.

This species resembles the *C. ephippicus* in general appearance, but the scutellation is very different. In the wide separation of the nasal and preocular plates it resembles the *C. stramineus*, but it differs from both species in the more numerous inferior labials and larger pregeniials. Thus, while in these there are but three labials in contact with the pregeniials, there are in the *C. fasciatus* four or five of these plates in contact with the pregeniials.

Two specimens are in the U. S.

National Museum collection; one of these has twenty-four and the other twenty-six black cross-bands on a white ground. Of these four in one and five in the other are on the tail. They are two scales long and eleven and two half scales in width; the spaces between them two

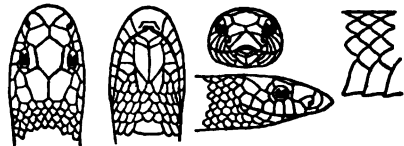


Fig. 244.

CHILOMENISCUS FASCIATUS COPE.

La Paz, Lower California.

Cat. No. 19630, U.S.N.M.

and a half scales long. There is a black patch on the head from the middle of the frontal to the posterior border of the occipital shields. No dark color on any of the under surface. No punctæ on the scales.

Cat. No. 12630; upper labials, 7; gastrosteges, 108 + 1; urosteges, 26; rows of scales, 13; total length, 235 mm.; tail, 33 mm.

Chilomeniscus fasciatus Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
12630	2	La Paz, L. California.....	Feb. —, 1882	L. Belding	Alcoholic.

CHILOMENISCUS CINCTUS Cope.

Chilomeniscus cinctus COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 303; Check-list N. Amer. Batr. Rept., 1875, p. 35.

Rostral plate projecting far backward, entirely separating the prefrontals, encroaching upon the postfrontals; the latter are in contact with the labials. Nostril connected by suture with the fronto-nasal suture. One very small preocular, two postoculars. Seven superior labials, the first longitudinal, the remainder vertical, except the last two, which are nearly equilateral. Symphyseal in contact with geneials. Scales broad, very smooth, in thirteen rows. Tail very short. Gastrosteges, eleven, one divided anal; urosteges, twenty-one pairs. Total length seven inches, tail eight lines. Ground color white, with a reddish tinge, encircled by sixteen black rings upon the body and three upon the tail. These rings are four or five scales in width, and separated by equal spaces; they are narrower on the belly. The head is black from the extremities of the occipital plates to the anterior part of the vertical and to the second labial plate. Chin shaded with black.

One specimen is preserved in the Museum of Comparative Zoology, Cambridge, Massachusetts, and I am indebted to Dr. Alexander Agassiz for the opportunity of studying it. Two others are in the U. S. National Museum.

Chilomeniscus cinctus Cope.

Catalogue No.	Locality.	From whom received.
15158 21843-4	Ballenas Bay, Lower California..... Yuma Desert (Monument 200), Arizona	U. S. Fish Commission. Dr. E. A. Mearns.

HYP SIGLENA Cope.

Hypsiglena COPE, Proc. Acad. Nat. Sci. Phila., June, 1860, p. 240; Bull. U. S. Nat. Mus., No. 32, 1887, p. 54; Proc. U. S. Nat. Mus., XIV, 1892, p. 617.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 208.

Pseudodipsas PETERS, Monatsber. Berlin Akad. Wiss., 1860, p. 521.

Comastes JAX, Elenco Sist. Ofid., 1863, p. 102.

Dentition diacranterian; that is, a long, smooth, posterior superior maxillary tooth, separated from the anterior by an edentulous space.

Pupil elliptic, erect. Head distinct, broad posteriorly, body cylindrical. Cephalic shields normal. Two nasals, nostril between; one loreal; two preoculars and two postoculars. Scales smooth. Gastrosteges not angulated. Anal and subcaudal scutellæ divided. Tail not elongate.

This genus includes four species of Central America, Mexico, and parts of the United States adjacent to the latter. They are of small size, and resemble considerably the more robust species of *Sibon*. Their vertical pupil indicates that they are of nocturnal habits.

But one species enters the limits of the United States.

HYP SIGLENA OCHRORHYNCHA Cope.

Hypsiglena ochrorhynchus COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 246.

Hypsiglena chlorophaea COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 246.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 209.

Muzzle shortly conic; rostral plate prominent, encroaching a little on the prefrontals. Nasal plates indistinctly separated, equal, their upper and lower borders parallel. Loreal longer than high. Lower preocular small, bounded anteriorly by the third upper labial. Eight upper labials, fourth and fifth entering the orbit; sixth and seventh very large. Vertical plate twice as long as broad; lateral borders slightly convergent. Superciliaries narrow; occipitals as long as, or longer than, vertical, and rounded posteriorly. Inferior labials eleven, sixth largest. Geneals two pairs, the posterior acute. Scales in twenty-one rows. Gastrosteges, 168; urosteges, 48 pairs.

The upper surface light gray, with a series of large brown spots, separated by intervals of one scale wide. These spots are about forty-eight in number, upon the body; they extend transversely from the seventh to the fifteenth rows of scales, and are three or four scales in length. On the posterior part of the body they sometimes divide longitudinally, their moieties alternating or becoming confluent into a zigzag band. Alternating with these on each side is a series of small spots formed by the brown borders of scales of the fifth and sixth rows. Another series of small spots opposite to the dorsal row is formed by the shading of the adjacent borders of the fourth and fifth rows with the same color. Many of the scales of the second row are also tipped with brown. There is a large brown spot on each side of the neck, sometimes confluent with an elongate central one, which extends to the occipital plates. A brown stripe passes from the eye to the neck spot, entirely covering the last upper labial. Top of the head brownish gray, indistinctly spotted with pale brown. Labial plate paler; frontals and rostral ochreous. Beneath yellowish white, immaculate.

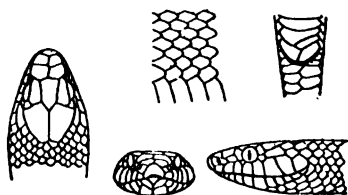


Fig. 245.

HYP SIGLENA OCHRORHYNCHA COPE.

× 1.3.

Cape St. Lucas, Lower California.

Cat. No. 5283, U.S.N.M.

This form occurs in Lower California, Sonora, and Chihuahua.

The form which I described as *H. chlorophæa* differs in its colors somewhat from the usual type. It is found in Arizona. Its characters are as follows:

Number of labials and rows of scales the same as in the last species. The scales of the body are, however, more elongate, and partly on this account are arranged in rows more oblique in an antero-posterior direction. The vertical plate is a little broader, and the head is narrower in proportion to its length. The body is rather more slender.

The color is a greenish ash, much darker than in the preceding species. The dorsal spots, instead of being brown, are black and separated by intervals of two scales in width. They are much smaller, occupying only the space from the ninth to the thirteenth longitudinal rows, and are one scale and a half long. They frequently divide and alternate, and their number on the body amounts to from fifty-eight to sixty-six. Two rows of smaller alternating spots appear on the sides, one upon the sixth and seventh rows of scales, the other on the fourth. The distribution of colors on the head and neck is much as is in the typical form, except that the neck spots are a little longer. The brown is, however, replaced by black, and the ochreous by olivaceous. The crown and muzzle are thickly punctuated with black. Beneath pale olivaceous. Gastrosteges, 167; urosteges, 55.

Hypsiglena oohrorhyncha Cope.

Catalogue No.	Number of specimen.	Locality.	When collected.	From whom received.	Nature of specimen.
5283	5	Cape St. Lucas, Lower California.	.....	John Xantus.....	Alcoholic.
8031	1	Camp Brent, Arizona.....	.....	E. Palmer.....	do.
8032	1	Fort Whipple, Arizona.....	.....	do.....	do.
1732	1	Durango, Mexico.....	.....	R. D. Cutts.....	do.
2303	1	.....	— —, 1855	Weston.....	do.
9216	1	.....	.....	.....	do.
12648	3	La Pas, L. California.....	Feb. —, 1882	L. Belding.....	do.
4676	1	Fort Buchanan, Arizona..	.....	Dr. B. J. D. Irwin, U. S. A.	Alcoholic type of <i>H. ochrophæa</i> .
15701	.....	Prescott, Arizona.....	.....	Capt. W. L. Carpenter...	.....
20482	.....	Witch Creek, San Diego, County, California.....	.....	H. W. Henshaw.....	.....
22579	.....	Mountains of San Diego County, California.....	.....	C. R. Orcutt.....	.....
15672	.....	San Diego, Texas.....	.....	Wm. Taylor.....	.....

ANOPILOPHALLINÆ.

Sulcus undivided; surface with transverse papillose fionces; colubriform; anterior teeth longer..... *Anoplophallus*¹ Cope

¹ Possibly this is the *Nymphopodium* Günther.

LYCODONTINÆ.

This group is intermediate in penial character to several others. It is allied to the Calamarinæ through *Grayia*, and to the Dromicinæ through *Homalosoma*. *Pseudaspis* shows resemblances in the hemipenis to the Natricinæ, and *Anomalodon* is similar to *Homalopsis*. I find that the flouncing of the penial structure is not sufficient to define the group as I at first thought.

I. Sulcus spermaticus undivided.

α. Teeth continuous; longer posteriorly.

Hemipenis spinous to apex; flounces indistinct; pupil round; nostril in prenasal; fusiform *Elapops* Günther.

αα. Teeth interrupted; longer in front.

Hemipenis flounced at apex; pupil erect; colubriiform *Lycodon* Boie

II. Sulcus spermaticus double.

α. Teeth longer anteriorly; (hemipenis bifurcate).

Hemipenis spinous to apex, not flounced; nostril in prenasal.

Lycophidium Fitzinger.¹

Hemipenis spinous, flounced *Boödon* Duméril and Bibron.

Hemipenis spinous, flounced *Lamprophis* Fitzinger.

αα. Teeth not longer anteriorly.

Hemipenis not bifurcate *Homalosoma* Wagler.

Hemipenis bifurcate *Pseudaspis* Cope

ααα. Teeth not longer posteriorly; (hemipenis bifurcate).

Colubriiform; rostral normal; spines very sparse... *Dromicodryas* Boulenger.²

Coronelliform; rostral trihedral, prominent; spines very numerous.

Anomalodon Jan.

The above genera are all Ethiopian, except *Lycodon*, which is Oriental.

I have been able to examine but few genera of this subfamily as to their penial structure. I therefore give a key of the genera supposed to belong to this group by authors, most, if not all, of which are properly so referred.

I. Anterior maxillaries not isolated.

α. Subcaudal scuta double.

β. Dorsal scales of equal size.

Two nasals; nostril in the anterior; a loreal; body much compressed.

Lycodryas Günther.

Two nasals; nostril between; body not compressed; lores plane.

Boödon Duméril and Bibron.³

Two nasals; body not compressed; lores longitudinally grooved.

Bothrophthalmus Schlegel.⁴

Two nasals; nostril in the anterior *Lycophidium* Fitzinger.⁵

One nasal; a loreal *Metoporphina* Günther.

ββ. Dorsal scales of unequal size.

Vertebral series smooth; body compressed *Homonotus* Hallowsell.

Vertebral series smooth; body round *Lamprophis* Fitzinger.

Vertebral series bicarinate; body round *Simocephalus* Gray.⁶

αα. Subcaudal scutella entire.

Two nasals; scales equal, smooth *Holuropholis* Duméril.

¹ *L. laterale* Hallowsell examined. ² *Lianthera* Cope, Amer. Naturalist, 1893, p. 481.

³ *Eugnathus* Duméril and Bibron. ⁴ Belongs perhaps to Colubrinæ.

⁵ *Alopecium* Duméril and Bibron. ⁶ *Heterolepis* Smith. *Diaphorolepis* Jan.

II. Anterior maxillaries isolated.

 α . Subcaudals in two rows. β . Nareal region with a pit.Scales smooth; anal entire..... *Bothrolycus* Günther. β . No nareal pit. γ . Longest teeth at front of maxillary.Scales keeled; two nasals; a loreal..... *Ophites* Wagler.• Scales smooth; two nasals; a loreal..... *Lycodon* Boie.Scales smooth; two nasals; no loreal..... *Tetragonosoma* Günther.Scales smooth; one nasal; a loreal..... *Leptorhyaon* Günther. $\alpha\alpha$. Subcaudal plates in one row.Scales keeled..... *Cercaspis* Wagler.Scales smooth..... *Cyclocorus* Duméril and Bibron.

The geographical distribution of these genera is as follows:

Paleotropical.	Palaearctic.	Nearctic.	Neotropical.	Ethiopian.
Dinodon.....				<i>Lycodryas</i> .
Ophites.....				<i>Boidon</i> .
Lycodon.....				<i>Bothrophthalmus</i> .
Tetragonosoma.....				<i>Lycophilidium</i> .
Leptorhyaon.....				<i>Homonotus</i> .
Cercaspis.....				<i>Lamprophis</i> .
Cyclocorus.....				<i>Simocephalus</i> .
				<i>Holuropholis</i> .
				<i>Bothrolycus</i> .

NATRICINÆ.

We have here a well-defined and homogeneous group, which is distributed in the northern continents and the oriental region. A species is said to be found in the Ethiopian, but I have not yet been able to examine the penial characters.

I. Sulcus undivided.

 α . Two large apical papillæ.Scuta normal; anal entire..... *Tropidoclonium* Cope. $\alpha\alpha$. No apical papillæ. β . No preocular plate.One internasal; anal divided; scales keeled. . . *Haldea* Baird and Girard.Two internasals; anal divided; scales keeled..... *Amphiaris* Cope.Two internasals; anal divided; scales smooth. *Virginia* Baird and Girard $\beta\beta$. Preocular present.No loreal; anal divided; two internasals..... *Storeria* Baird and Girard.A loreal; anal entire; two internasals..... *Eutania* Baird and Girard.A loreal; anal undivided; one internasal..... *Liodytes* Cope.A loreal; anal divided; scale-pits double..... *Natrix* Laurenti.¹A loreal; anal divided; no scale-pits..... *Seminatrix* Cope.

II. Sulcus bifurcate; (hemipenis furcate).

Two apical papillæ; plates as *Natrix*..... *Ceratophallus* Cope.No papillæ; plates as *Natrix*..... *Bothrodytes* Cope.²No papillæ; one prefrontal plate..... *Trimerodytes* Cope.³¹ Including *Amphiesma* Duméril and Bibron.² Including *Diplophatulus* Cope.³ Proc. Acad. Nat. Sci. Phila., 1894, p. 426.

These genera are distributed as follows:

Neartic.	Palaartic.	Paleotropical.
<i>Tropidoclonium</i>		
<i>Haldea</i>		
<i>Virginia</i>		
<i>Storeria</i>		
<i>Eutania</i>		
<i>Natrix</i>	<i>Natrix</i>	<i>Natrix</i>
<i>Seminatrix</i>		<i>Ceratophallus</i>
<i>Liodytes</i>		<i>Bothrodytes</i>
<i>Amphiardis</i>		<i>Trimerodytes</i>
		<i>Atretium</i>

The genus *Natrix* is the water-snake form of all temperate regions and of tropical Asia. The European *N. natrix* is terrestrial for the most part, but the North American and Indian species are very aquatic, diving to the bottom of the water to escape enemies on the shore. The genus *Eutania*, for the most part North American, includes many species of terrestrial habits, and they are all often found far from water. The *E. saurita* takes to the water if alarmed. A number of North American genera are degenerate forms of *Natricinae*, which have adopted a terrestrial and even a burrowing life like that of the *Calamariinae*. *Storeria* is like a *Natrix* reduced in the lateral head plates and with feeble jaws. *Tropidoclonium* is related in the same way to *Eutania*. *Haldea* and *Amphiardis* have a more decidedly fusiform character. *Haldea* displays the hypopophyses continued to the caudal region, as in the other members of the subfamily.

The African members of the family are few in number, as but one species of *Natrix* (*N. mortuarius*) occurs there.

NATRIX Laurenti.

Natrix LAURENTI, Specimen Synopsis Reptilium, 1768, p. 73.—BONAPARTE, Fauna Italica, 1840, pp. 172, 173.

Tropidonotus KÜHL, Isis von Oken, 1826, p. 205.—BOIE, Isis von Oken, 1827, p. 518.—WAGLER, Systema, 1830, p. 179.—SCHLEGEL, Ess. Phys. Serp., 1837, p. 296.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, pp. 549-724.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 58.

Nerodia BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 38.

Regina BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 45.—COPE, Proc. Acad. Nat. Sci. Phila., 1862, p. 338; Bull. U. S. Nat. Mus., No. 32, 1887, p. 71.

Teeth generally longer on the posterior than the anterior parts of the maxillary bone, ungrooved. Two internasal, two prefrontal, and two nasal scuta; one loreal; parietals distinct. Anal plate divided. Scales keeled; scale-pits double. Gastrosteges well developed, not angulated or keeled.

This genus is widely distributed throughout the Northern Hemisphere, embracing numerous species in North America and in Eurasia, but is wanting on the Pacific district of the former. On the American continent a single species, *N. rhombifer* Hallowsell, extends as far

south as Vera Cruz from its North American range. In the Old World two species only, *T. mortuarius* and *T. ferox*, are found in Africa, and several species occur in the Malaysian Archipelago. They are all aquatic in their habits, living chiefly in and on the shores of fresh waters and feeding on small fishes and other aquatic vertebrates, especially frogs. Some of these species grow to a considerable size, and often present a savage appearance, owing to the small eyes and wide gape of the mouth. Even in these specimens the teeth are not large enough to inflict more than slight and harmless scratches.

An allied genus accompanies this one in the East Indies (*Amphiësma* Duméril and Bibron), in which the scales have no pits. In North America another allied genus (*Eutania*) also has no pits, and is further characterized by the undivided condition of the anal scutum.

I find twelve well-distinguished species in North America, which are characterized as follows:

I. Temporal scuta 1-2 or 3; parietal scuta normal.

α. Oculars 2-2; scales in 19 rows.

Smaller, muzzle wider; three black stripes above; four brown ones below; first row of scales keeled.....*N. leberis* Linnæus.

Larger, muzzle narrower; no black bands above; two, sometimes three or four, imperfect bands below.....*N. grahamii* Baird and Girard.

Muzzle short, brown above, with a broad median band; below yellow, with two rows of spots; first row of scales smooth.....*N. rigida* Say.

αα. Oculars 1-2; scales in 21 rows.

Superior labials 8; head elongate; brownish yellow, immaculate.....*N. usta* Cope.

ααα. Oculars 1-3; scales in 19-21 rows.

Four brown bands above; a median row of yellow spots below.

N. clarkii Baird and Girard.

Three rows of brown spots above, which may form stripes anteriorly and cross bands posteriorly; a median row of yellow spots below.

N. compressicauda Kennicott.

A row of lateral spots, often indistinct; below uniform; tail slender, cylindrical.....*N. valida* Kennicott.

αααα. Oculars 1-2-3; scales in 23-25 rows.

Superior labials 9; preoculars 2; spots longitudinal.....*N. bisecta* Cope.

Superior labials 8; preoculars 1; spots when present transverse.

N. fasciata Linnæus.

ααααα. Oculars 1, 2-3, 4; scales in 27-29 rows.

Eye resting on (usually one) labial; alternating wide dorsal and lateral spots connected at angles.....*N. rhombifera* Hallowell

Eye separated from labials by scales; numerous narrow cross bands, sometimes broken.....*N. cyclopium* Duméril and Bibron.

II. Temporal scales 2-4, 5; parietals much reduced in size.

α. Oculars 1-2; scales 31-33 rows.

Eye resting on one labial; alternating dorsal and lateral spots, which do not touch.....*N. tarispilota* Holbrook.

Of these species *N. leberis* and *N. fasciata* are distributed over both the Eastern and the Austroriparian districts. The other species belong to the Austroriparian district except the *N. valida*, which is the only species of the Sonoran district. The *N. grahamii* extends up the Mississippi River to north of the Austroriparian limits to northern Illinois and Indiana, and is not known from east of the latter State. *N. rhom-*

bifera has a similar distribution, except that it remains within the boundaries of the Austroriparian district, not extending north of southern Illinois and Indiana. *N. cyclopius* has not been found out of this district, while the *N. compressicauda* and *N. usta* are restricted to Florida. *N. taxispilota* is confined to the eastern part of the Austroriparian region and Florida, while *N. rigida* has a similar range, omitting Florida, and apparently extending north to Pennsylvania. *N. bisecta* is known from but one specimen.

NATRIX TAXISPILOTA Holbrook.

Natrix taxispilota COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 392.

Tropidonotus taxispilota HOLBROOK, N. Amer. Herp., IV, 1842, p. 35, pl. VIII.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 245.

Head proportionally small, subtriangular, pointed on the snout. Frontal plate broad, subquadrangular; parietals small. Two post-

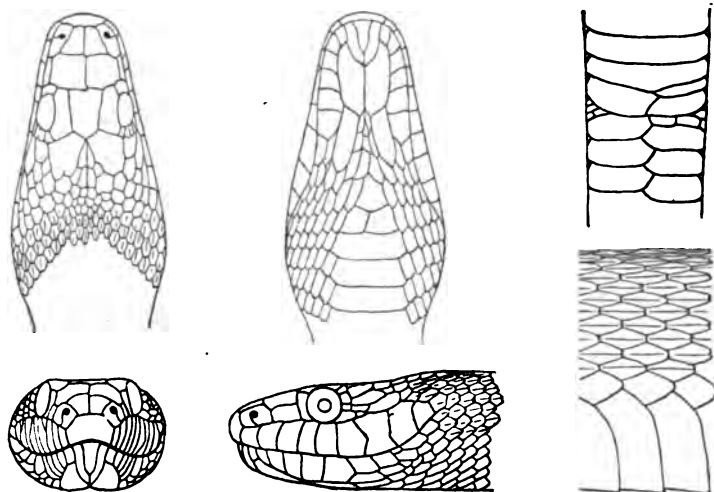


Fig. 246.

NATRIX TAXISPILOTA HOLBROOK.

= 1.

Kinston, North Carolina.

Cat. No. 8361, U.S.N.M.

orbital plates; anteorbital narrow. Dorsal rows of scales thirty-one, all carinated. Brown, with three series of subquadrangular blackish blotches, which do not touch each other.

The head is proportionally small, and conical forward. The eyes also are small. The frontal plate has the shape of an elongated quadrangle. The parietal plates are quite small in consequence of lateral and posterior subdivisions. Rostral low, twice as wide as high. Internasals much longer than wide; prefrontals nearly square. Superior labials eight, the middle of the orbit over the fourth plate, the fifth excluded by the lower postocular; sixth and seventh very large, sometimes subdivided. Inferior labials eleven, the seventh the largest. Postgenaeals not larger than pregenaeals. There are two large post-

orbital plates. The superciliaries are narrow and elongated. Temporals more numerous than in any other species of the genus; two in the first row smooth, the remainder small, keeled, and nearly similar to the body scales.

Ground color reddish brown, with three series of subquadrangular blackish blotches about forty-six in number, the twenty-sixth opposite the anus. They embrace transversely from seven to ten rows of scales, and longitudinally three scales on the two anterior thirds of the body, and two scales on the posterior third. The space between the blotches is equal to the blotches themselves. The lateral series are isolated; that is to say, not contiguous to the dorsal series except sometimes toward the origin of the tail and along the latter region. The blotches extend over nine or ten lateral rows of scales, and affect from three to five scales. Equilateral on the anterior part of the body, they become narrower on the posterior part, and taper upward. The space between is narrower by one scale. On the tail the dorsal series of blotches has almost entirely disappeared; now and then an irregular patch may be seen confluent with the lateral series, which remain conspicuous to the very tip of that organ. The lower surface of the body is yellow, with irregular deep chestnut blackish-brown patches, the lateral ones contiguous to the lateral series. These may be so extended as to cover the greater part of the gastrosteges. Head uniform dark-brown; gular region thickly dusted with yellow and blackish.

Cat. Nos.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail mm.
464	139 + 1.	72.	31.	779.	193.
1344	150 + 1.	99.	29.		
6409	146 + 1.	72.	33.	825.	223.
10700	147 + 1.	70.	33.	1,408.	336.
13887	151 + 1.	95.	31.	1,328.	310.

This species is a very distinct one and is remarkable for various peculiarities. One of these is the great reduction in size of the parietal scuta, which frequently do not exceed the prefrontals in dimensions. This reduction has been supposed by Professor Heilprin to be exceptional in the species, and he has accordingly named a specimen from Florida as a variety *brockii*. The character is, however, normal in the species. The sixth and seventh superior labials are very large, and their superior portions are occasionally cut off, as in Cat. No. 13887. In Cat. No. 10700 there are abnormally three postoculars on both sides, but this abnormality reaches a remarkable degree in Cat. No. 6409. Here a complete circle of scales which surrounds the eye, as in *N. cyclopium*, consists of three preoculars and four or five postoculars. There are ten superior labials, of which the last three are divided longitudinally. The frontal plate has an incomplete median groove and the parietals two incomplete grooves, pointing to a subdivision of head plates, such as occurs in some of the East Indian water snakes, as the genus *Cerberus*.

This is the largest American water snake. Its range is coextensive with the austroriparian subregion, extending from the Atlantic region from the Potomac River to Florida and west to Louisiana, inclusive.

Natrix taxispilota Holbrook.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1344	1	Riceboro, Georgia .....	.....	Dr. W. L. Jones	Alcoholic type.
464	1	! .....	.....	.....	do.
1343	1	Georgetown, District of Columbia.	.....	Weston	do.
10700	1	Avoca, North Carolina....	Apr. —, 1878	J. W. Milner	do.
8361	1	Kinston, North Carolina..	May —, 1875	H. W. Welsber	do.
12387	1	New Orleans, Louisiana ..	.....	R. W. Shufeldt	do.
19987	2	Lake Eustis, Florida .....	.....	Theo. Holm	do.
19998					

NATRIX CYCLOPIUM Duméril and Bibron.

Tropidonotus cyclopium DUMÉRIL and BIBRON, *Erp. Gén.*, VII, p. 576.—GÜNTHER, *Cat. Col. Snakes Brit. Mus.*, 1858, p. 77.—COPE, *Proc. Acad. Nat. Sci. Phila.*, 1861, p. 299; *Check-list N. Amer. Batr. Rept.*, 1875, p. 43.—BOULENGER, *Cat. Snakes Brit. Mus.*, I, 1893, p. 244.

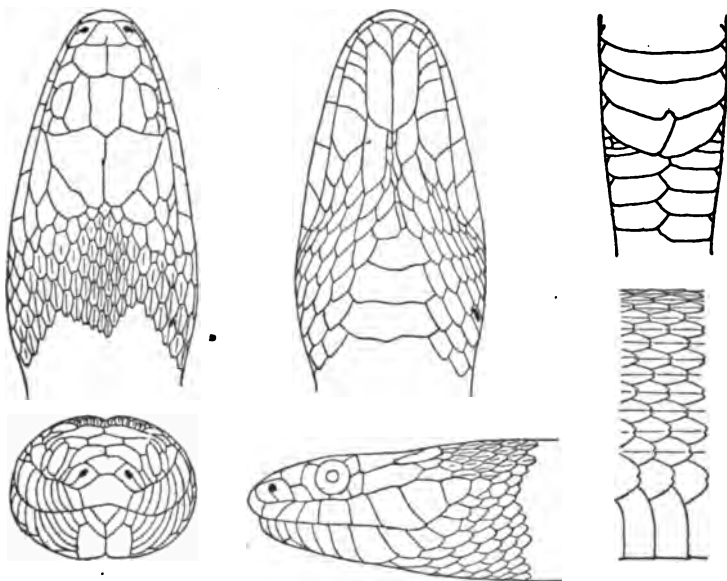


Fig. 247.

NATRIX CYCLOPIUM DUMÉRIL AND BIBRON.

= 1.

Cat. No. 12407 f, U.S.N.M.

Scales in twenty-nine longitudinal rows; the first row smooth, the second weakly, and the remainder strongly keeled, and all notched at the apex. Rostral low, twice as broad as high; internasals triangular, a little longer than wide; prefrontals small, wider than long. Frontal

not as narrow as in some species, superciliaries much narrowed anteriorly. Parietals large, obliquely truncated by a large second temporal, exceeding in length the muzzle in front of the frontal plate. Nasals short anteroposteriorly, the anterior elevated and narrow; postnasal

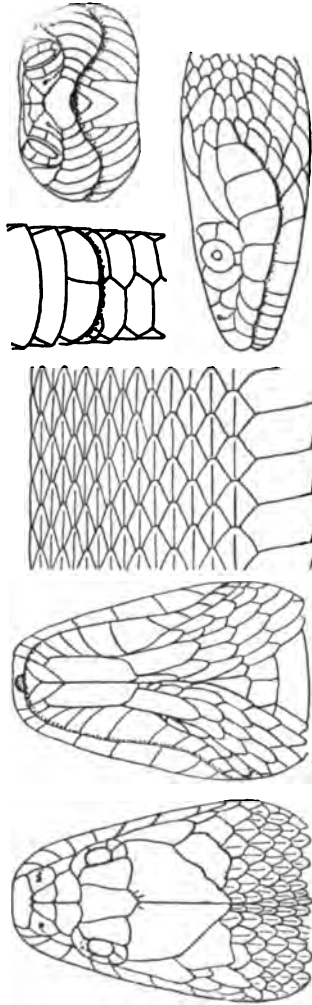


FIG. 248.
NATRIX CYCLOPHIUM DUMÉRILO AND BIBRON.

= 1.

New Orleans, Louisiana.
Cat. No. 18018, U.S.N.M.

making a suture with prefrontal. Loreal longer than high, very oblique behind. Preocular one, postoculars two; suboculars two, separating the orbit from the superior labial plates. Temporals one, three; the first long, bordering two labials and a scute; those of the second and third rows not keeled. Middle of eye above the fourth superior labial. Superior labials eight, sixth and seventh large, sixth twice as high as wide. Inferior labials twelve, the seventh largest. Postgenaeals shorter than pregenaeals.

Color brown above and yellow below. On the upper surfaces there are on each side two rows of alternating short cross-bars of a darker color, which are about one and one-half scales wide, and are separated by interspaces of about three scales. The median line for a width of four scales is not spotted, or is very imperfectly so, forming a broad vertebral band of a color darker than the general ground. In young specimens the pattern is very distinctly seen, but in adults the ground becomes so dark as to obscure it very much.

The head is uniform brown, the oral edge of the superior labial plates only being yellow. On the yellow ground of the inferior surfaces there appear, on the anterior third only of the length, dark shades on the anterior parts of the gastrosteges. These extend and blend so that on the posterior two-thirds of the length in the adult the color may be said to be blackish-brown with yellow spots.

Cat. Nos.	Gastrostege.	Urostege.	Scales.	Length. mm.
13018.....	150 + 1.	.....	29.	877. ¹
4433.....	134 + 1.	86.	29.	
1639.....	137 + 1.	60.	29.	

This well-marked species is much less abundant than its allies, the *N. rhombifera* and *N. taxispilota*. The few specimens in the U. S. National Museum come from the three extreme points of the austro-riparian districts, namely, Florida, New Orleans, and southern Illinois.

The *N. cyclopium* is nearest the *N. rhombifera*. The pattern of coloration is quite different, and the scutellation also differs in several important respects. In the *N. cyclopium* the nasal plates are shorter anteroposteriorly, and there are only two scuta which are properly post-ocular. The posterior temporals are smoother and not beeled, and the large scales are emarginate, which they are not in the *N. rhombifera*.

The possession of a series of scales below the orbit, while present in all known specimens of this species, is not confined to it. I have seen it in a specimen of the *N. taxispilota*, and it is found in the only known specimen of the *Natrix anoscopus*² Cope, from Cuba.

Natrix cyclopium Duméril and Bibron.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
4433	1	Micanopy, Florida.....	Dr. J. H. Bean	Alcoholic.
1639	1	Southern Illinois.....	R. Kennicott.....	do.
12407	1	.....	.....	do.
13018	1	New Orleans, Louisiana....	Dr. R. W. Shufeldt.....	do.
16711	1	Lake Catherine, Louisiana .	G. Kohn	do.

Two fine specimens of this species from Florida lived for some time in the reptile house of the Zoological Society of Philadelphia.

NATRIX RHOMBIFERA Hallowell.

Troptidonotus rhombifer HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1852, p. 177.—
COPE, Check-list N. Amer. Batr. Rept., 1875, p. 43.

Troptidonotus fasciatus var. *rhombifer* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 244.

Nerodia rhombifer BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 147.

Nerodia holbrookii BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 43.

Scales in twenty-seven rows, the larger inferior slightly keeled, the others very strongly, all entire at the extremity. Head very distinct, muzzle moderately narrowed. Rostral plate quite or nearly twice as wide as high; loreal short, as high as long; oculars 1-3; temporals 1-3, those succeeding the first keeled. Frontal plate longer than wide, but wider than *N. sipedon*, and superciliaries proportionally narrow. Parietals wide, not elongate, equal muzzle from frontal plate. Superior labials eight, the middle of the orbit above the middle of the fourth.

¹To vent; half of tail wanting.

²*Troptidonotus anoscopus* Cope, Proc. Acad. Nat. Sci. Phila., 1861, p. 299.

Fifth excluded from the orbit by the inferior postoculars; sixth and seventh much larger than any of the others. Inferior labials eleven, fifth and sixth largest; postgenaeals a little longer than pregenaeals.

Ground color, above brown; below yellow. Above, three rows of transverse black spots, one on each side and one crossing the middle line, alternating with the laterals. The adjacent angles of the spots of the middle and lateral series are connected by oblique black bars, which thus inclose with the dorsal spots a series of transverse diamond-shaped or hexagonal spaces of the ground color on the middle region of the back. The lateral interspaces are partly closed below by two semicircular spots of brown on the two gastrosteges below them; and the two gastrosteges below the lateral spots also have brown spots of a triangular form in continuation of them. The semicircular ventral

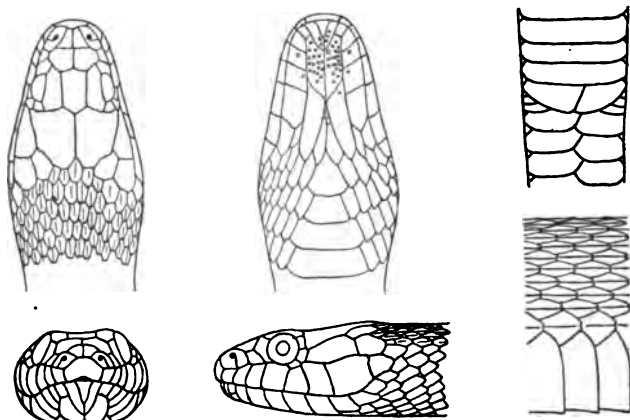


Fig. 249.

NATRIX RHOMBIFERA HALLOWELL.

=1.

Dallas, Texas.

Collection of E. D. Cope.

spots are nearer the middle line than the triangular. The middle line is unspotted or has but feeble traces of spots. I counted thirty-five dorsal and as many lateral spots on a specimen from New Orleans (Cat. No. 13354).

The head is a uniform brown above; and on the nape is an obscure chevron-shaped black mark, with an obtuse angle forward. The superior labials have black posterior borders and are tinged with yellow medially. The inferior labials are similar, but more distinctly yellow. Scales of gular region uniform yellow.

Cat. Nos.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
1117.....	144 + 1.	69.	27.		
1635.....	149 + 1.	69.	27.		
10646.....	148 + 1.	70.	27.	930.	218.
14014.....	141 + 1.	78.	27.		
14657.....	150 + 1.	65.	27.	906.	211.

In thirteen specimens in which I counted the rows of scales I found but one in which the number is not twenty-seven. This was in Cat. No. 10759, a small and starved individual, which had twenty-five rows. In dimensions this water snake rather exceeds the *N. s. fasciata*, and is only exceeded in one fauna by the *N. taxispilota*.

The Lower Mississippi is the headquarters of this species, where it is very abundant. It is not yet known from east of that river, but ranges north to the limits of the Austroriparian region to southern Illinois and west throughout Texas. It is the only one of our water snakes which extends to the Tierra Caliente of Mexico, having been brought by the exploration commission from Misantla, in the State of Vera Cruz..

Natrix rhombifera Hallowell.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1635	1	Southern Illinois .....	.....	R. Kennicott	Alcoholic.
7253	1	Arkansas River .....	.....	Dr. S. W. Woodhouse.	do.
1230	1	Lafayette, Indiana .....	.....	.....	do.
1117	1	Prairie Mer Rouge, Louisiana. ....	.....	Jas. Fairie	do.
5195	1	Grand Coteau, Louisiana .....	.....	.....	do.
1832	1	Rio Pecos, Texas .....	.....	Capt. John Pope, U. S. A.	do.
11056	1	Wheatland, Indiana	May 22, 1881	R. Ridgway	do.
10643	1	do	Apr. —, 1881	do	do.
12021	1	Mount Carmel, Illinois	Nov. —, 1881	L. M. Turner	do.
10647	1	Wheatland, Indiana	Apr. —, 1881	Robert Ridgway	do.
10644	1	do	Apr. —, 1881	do	do.
10642	1	do	Apr. —, 1881	do	do.
10640	1	do	Apr. —, 1881	do	do.
10762	1	do	May —, 1880	do	do.
10646	1	do	Apr. —, 1881	do	do.
10563	1	do	Apr. —, 1881	do	do.
11143	1	do	May 10, 1881	W. F. Page, U. S. F. C.	do.
11065	1	Wheatland, Indiana	May 23, 1881	Robert Ridgway	do.
14657	2	do	—, 1886	D. Ridgway	do.
14014	1	do	—, 1884	do	do.
13344	1	do	do	do	do.
13345	1	do	do	do	do.
13347	1	do	do	do	do.
17068-9	.....	St. Louis, Missouri .....	.....	J. Hurter	do.

From the large proportion of specimens in which the end of the tail is lost, I suspect the enemies of this species are numerous. Can they be turtles?

NATRIX FASCIATA Linnæus.

Natrix fasciata COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 392.

Coluber fasciatus LINNÆUS, Syst. Nat., I, 1766, p. 378.

Coluber sipedon LINNÆUS, Syst. Nat., I, 1766, p. 379.

Tropidonotus fasciatus DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 566.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 76.—BOULENGER, part, Cat. Snakes Brit Mus., I, 1893, p. 242.

Tropidonotus sipedon COPE, Check-list N. Amer. Batr. Rept., 1875, p. 42.

Scales in twenty-three or twenty-five rows, all keeled, the external larger than the others. Eight superior labials, center of eye over suture between the fourth and fifth. Orbitals one to three; temporals one, two, or three. Rostral plate not much elevated; internasal scuta each longer than wide. Frontal plate rather narrow; parietal plates each as long as frontal and prefrontal plates together. Pregeneals and post-

genaeals subequal. General form robust; tail not long. Head quite distinct from body, widened posteriorly, moderately narrowed to the muzzle.

Ground color above from bright reddish brown to gray, marked by large dark brown transverse spots variously arranged, or immaculate. Below, yellowish or reddish, with or without chestnut or reddish-brown spots which are not tessellated, but are more or less rounded. Length, about a meter.

This abundant and widely distributed species presents several well-marked subspecies which have been sometimes described as species. These generally have a definable geographical range. Together they occupy the entire Eastern and Austroriparian regions.

Belly with dark spots which are lateral and angular; gastrosteges not margined; spots of back broad especially anteriorly, continued to belly; sides of head pale, with black postocular band; scales generally in 23 rows. *N. f. fasciatus* Linnaeus. Belly with gastrosteges narrowly margined with brown, margins inclosing yellow spots by junction at or near ends; dorsal spots numerous, narrower, extending to belly; sides of head pale, with brown postocular band; scales in 25 rows;

N. f. pictiventris Cope.

Belly spotted; back with brown spots which extend to the sides anteriorly only, but which mostly alternate with lateral spots; no postocular band;

N. f. sipedon Linnaeus.

Belly spotted; dorsal band transverse anteriorly; posteriorly wanting, and lateral spots only..... *N. f. pleuralis* Cope.

Belly unspotted; dorsal and lateral spots alternate to the head;

N. f. transversa Hallowell.

Belly unspotted; neither dorsal nor lateral spots *N. f. erythrogaster* Shaw.

These subspecies belong to the Austroriparian region, except *N. s. sipedon*, which is nearly confined to the Eastern, and *N. s. transversa*, which belongs to the Texan district.

It is semiaquatic in its habits, being usually found on the border of the water, where it takes refuge when alarmed. It is an expert swimmer and a skillful fisher, since fishes form a large part of its food. It captures fishes by quick movements below the surface of the water. When cornered it is pugnacious, but its bite is insignificant. Its average adult length is three feet, but it frequently exceeds that size.

NATRIX FASCIATA FASCIATA Linnaeus.

Natrix fasciata fasciata COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 392.

Coluber fasciatus LINNEUS, Syst. Nat., I, 1766, p. 378.—GMELIN, Syst. Nat. Linn., I, Pt. 3, 1788, p. 1094.—HOLBROOK, N. Amer. Herp., I, 1838, p. 93, pl. xx.

Coluber porcatus LATREILLE, Hist. Nat. des Rept., IV, 1882, p. 32, pl., fig. 1.—DAUDIN, Hist. Nat. Rept., VI, 1803, p. 204.—HARLAN, Journ. Acad. Nat. Sci. Phila., 1827, p. 356.

Tropidonotus fasciatus HOLBROOK, N. Amer. Herp., 2d ed., III, 1842, p. 25, pl. v.—DEKAY, New York Fauna; Rept., 1842, p. 47.—var. A, GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 76.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 42.

Nerodia fasciata BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 39. *Tropidonotus fasciatus*, form *typica* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 244.

Transverse lozenge-shaped or oblong black patches on the back, tapering on the sides, separated by oblong or triangular marks of red on the flanks; dorsal spots generally much longer anteriorly. No lateral spots alternating with the dorsal spots. Dorsal rows of scales twenty-three, sometimes twenty-five.

Head elliptical, tapering to the snout. Dorsal rows of scales twenty-three to twenty-five, all carinated; carinæ on the dorsal region very conspicuous. Scales on the outer row broad and rounded posteriorly. Tail one-fourth of total length, very much tapering. Frontal plate elongated, pentagonal, posterior angle obtuse. Superciliaries very narrow, one preorbital and three postorbitals. Superior labials eight in number; sixth and seventh very large. Inferior labials nine; fourth

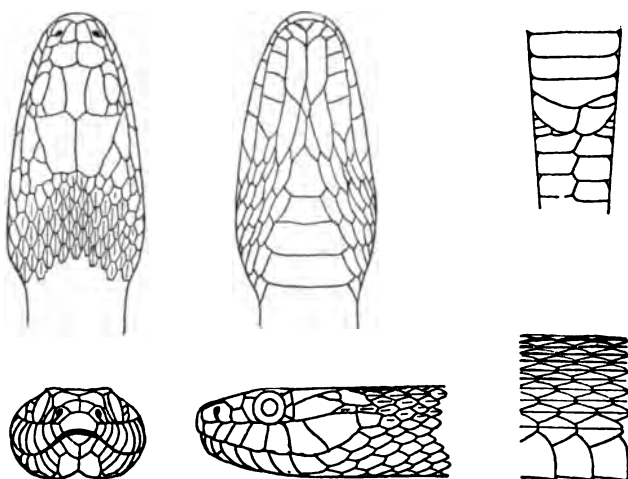


Fig. 250.

NATRIX FASCIATA FASCIATA LINNÆUS.

= 1.

Clearwater, Florida.

Cat. No. 10740, U.S.N.M.

and fifth largest. A large temporal shield anteriorly contiguous to the postorbitals, followed by two other large scuta.

Ground color above in the adult uniform blackish brown, lighter in the young, crossed by transverse lozenge-shaped blackish patches irregularly tapering on the sides throughout the length. There are from thirty to thirty-eight subtriangular or vertical oblong red spots extending between three cross-bands to the abdominal scutellæ. The twenty-sixth of these red markings is opposite to the anus, and twelve smaller ones may be observed along the tail, gradually diminishing posteriorly. A black vitta extends from the posterior rim of the eye to behind the angle of the mouth, above and below which a light elongated patch tinged with red may be seen. Labials dusky, margined with reddish brown. Belly yellowish or reddish, marked with

darker reddish spots on one side or the other, which are more or less black bordered, or the entire gastrostege may be black edged, and in some specimens the black edges are so wide as to cover almost all of the plate, so that the belly and under side of the tail are black. (Cat. Nos. 13024-13028; New Orleans.)

The number of spots crossing the back is very variable. They are usually wider than in the *N. f. sipedon* and in some individuals are of double or treble the width. In that case the interspaces have an oblique direction. Such specimens are most common in Louisiana, while those with short cross-bands, separated by narrow intervals, are more usual in Florida. In a specimen from Volusia, Florida, in my collection there are thirty-three cross-bands anterior to the tail, and the gastrosteiges are yellow, with a narrow brown border at the base. These borders spread out at the end of every second or third scutum into a reddish-brown spot.

Cat. Nos.	Gastrosteiges.	Urosteiges.	Scales.	Length. mm.	Tail. mm.
5411.....	141 + 1.	66.	23.		
5474.....	137 + 1.	172.	23.		
9100.....	136 + 1.	81.	23.		
1057.....	131 + 1.	71.	25.		
10563.....	124 + 1.	67.	23.	1100.	265.
10632.....	126 + 1.	†	23.		
10740.....	136 + 1.	70.	23.		
13024.....	134 + 1.	72.	23.		
13026.....	128 + 1.	62.	25.		

Natrix fasciata fasciata Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1057	1	Charleston, South Carolina.	.....	Dr. S. B. Barker	Alcoholic type.
5474	1	Grand Coteau, Louisiana.	.....	.....	do.
5197	1	do	.....	.....	do.
4801	1	do	.....	.....	do.
1252	1	Prairie Mer Rouge, Louisiana.	.....	J. Potts	do.
8898	1	New Orleans, Louisiana	— —, 1875	Prof. D. S. Jordan	do.
7210	1	Liberty County, Georgia	.....	Dr. W. L. Jones	Head, alcoholic.
6411	1	Newbern, North Carolina.	.....	.....	Alcoholic.
9100	1	Wilmington, North Carolina.	.....	.....	do.
10649	1	Wheatland, Indiana	Apr. —, 1881	R. Ridgway	do.
9096	1	Ferry Landing, Virginia.	May 29, 1875	H. W. Welsher	do.
5411	1	Fort Kearney, Nebraska.	.....	C. McCarthy	do.
1100	1	Galveston, Texas	— —, 1858	E. B. Andrews	do.
4734	1	Micanopy, Florida	.....	Dr. T. H. Bean	do.
1696	1	Calcasieu Pass, Louisiana.	— —, 1858	Wurdeman	do.
1111	1	Cat Island	— —, 1858	do	do.
10758	1	Ella Sutton Beach	— —, 1881	Dr. J. A. Kite	do.
9697	1	Arlington, Florida	— —, 1878	G. B. Goode	do.
14739	1	Gainesville, Florida	.....	James Bell	do.
13779	1	Punta Rassa, Florida	— —, 1883	Charles K. Ward	do.
10563	1	Wheatland, Indiana	.....	R. Ridgway	do.
13024	4	New Orleans, Louisiana	.....	R. W. Shufeldt	do.
15554	1	Cook County, Texas	.....	G. H. Ragdale	do.
14506	1	Coast of North Carolina.	.....	Capt. R. G. Evans	do.

This form is characteristic of the Austroriparian region, ranging up the Mississippi and Ohio to southwest Indiana and southwestward throughout Texas.

This snake has considerable resemblance in color to the moccasin, *Ancistrodon piscivorus*, which inhabits the same localities, so that it is commonly mistaken for it by uncritical observers. Its more slender form should, however, distinguish it, even on the most casual observation.

NATRIX FASCIATA PICTIVENTRIS Cope.

Natrix fasciata pictiventris COPE, American Naturalist, XXIX, 1895, p. 677.

Brown transverse bands numerous, separated by short intervals, and extending to the belly throughout the length. Gastrosteges narrowly margined at the base with brown, the margins turning at or before reaching the ends of the gastrosteges and uniting so as to inclose transverse yellow spots, which are wider than those seen in *N. compressicauda*. Sides of head light brown, generally with a black postocular band; top of head black. Scales in 25 rows; in one specimen (Cat. No. 19798) in 27 rows.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
5473 (injured at end).....	8.	125.	45.	25.	580.	120.
19999	8.	124.	86.	25.	550.	162.

In some specimens (Cat. No. 13779) the transverse bands are very distinct, as in young individuals; in Cat. Nos. 19798 and 11444, they are connected by the same color along the median vertebral line.

This subspecies is restricted to Florida. It approaches the *N. compressicauda* in the coloration of the belly.

Natrix fasciata pictiventris Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
5473	1	Palatka, Florida	T. Glover	Alcoholic type.
10449	2	Gainesville, Florida	J. Bell	do.
10739	1	Clearwater, Florida	S. T. Walker	do.
11444	1	Gainesville, Florida	J. Bell	do.
13644	2	Georgiana, Florida	W. Wittfield	do.
13693		Georgiana, Florida	W. Wittfield	do.
13779	1	Punta Rassa, Florida	C. K. Ward	do.
19798	1	Western Florida	Dr. Henshall	do.
19999	1	Lake Eustis, Florida	Theo. Holm	do.

NATRIX FASCIATA SIPEDON Linnaeus.

Coluber sipedon LINNÆUS, Syst. Nat., 12th ed., 1766, I, p. 379.—GMELIN, Linn. Syst. Nat., 13th ed., I, Pt. 3, 1788, p. 1098.—SHAW, Gen. Zool., III, Pt. 2, 1802, p. 496.—MERREM, Tentamen, 1820, p. 124.—HARLAN, Journ. Acad. Nat. Sci. Phila., 1827, p. 351.—STORER, Report Mass., 1839, p. 228.—THOMPSON, Hist. Vermont, 1842, p. 118.

Tropidonotus sipedon HOLBROOK, N. Amer. Herp., III, 1842, p. 29, pl. vi.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 568.

Tropidonotus sipedon sipedon COPE, Check-list N. Amer. Batr. Rept., 1875, p. 42.

Tropidonotus fasciatus var. *B.* GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 75.

Tropidonotus fasciatus var. *sipedon* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 244.

Coluber poecilogaster WIED, Reise Inn. Nord Amerika, I, 1839, p. 106

General color dull brown, exhibiting narrow transverse bands of lighter, margined with dark brown or black; these bands generally about a half a scale in width and their margins more or less parallel immediately on the back. This is especially the case posteriorly, where they are usually at right angles to the axis of the body, anteriorly they are more or less oblique, and widen rapidly toward the abdominal scutellæ. Sometimes the general brown line is so predominant as to render the transverse marks more or less obsolete, and the general tint then appears uniform above. The abdomen is always dull yellowish, each scutella with large blotches of light brown, margined with black.

In young individuals and in those generally in which the epidermis has been removed, the normal type of coloration is seen to consist of three series of nearly quadrate dark brown spots, with still darker bor-

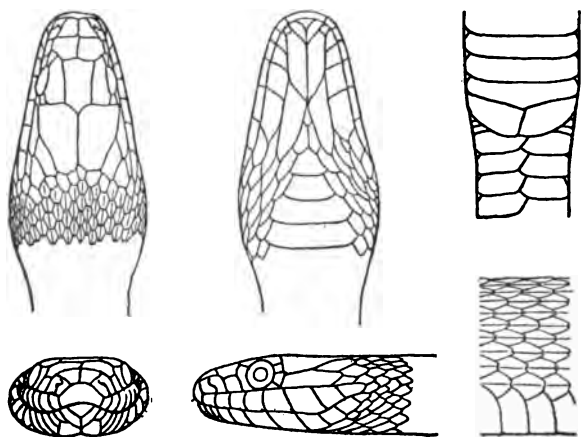


Fig. 251.

NATRIX FASCIATA SIPEDON LINNÆUS.

= 1.

Philadelphia, Pennsylvania.

Collection of E. D. Cope.

der, one dorsal and one on each side. These are so disposed that the two corresponding lateral spots are opposite the interval between the two dorsal, and thus appear to be connected by a light line. The longitudinal diameter of the dorsal spots, amounting to three or four scales, is the greater; just the reverse of what is the case with the lateral. Of these lateral spots there are generally about thirty, two on each side from the head to the anus, the spaces between to or less than the spots, not greater, as in *T. fasciata*. While the pattern is generally quite distinguishable on the posterior half of the body, anteriorly it becomes confused, the lateral blotches standing opposite to the dorsal and becoming confluent, so that the back appears crossed by lozenge-shaped blotches extending to the abdominal scutellæ, and this separated on the sides by triangular intervals of a lighter color.

Occasionally the color appears to be a dull and rather light brown,

with the back crossed by narrow transverse lines, with dark (nearly black, but still not distinct) margins.

Cat. Nos.	Gastroteges.	Urostegees.	Scales.	Length. mm.	Tail. mm.
1091.....	150 + 1.	62.	25.		
1092.....	129 + 1.	?	23.		
1108.....	144 + 1.	63	23.		
1115.....	148 + 1.	?	23.		
1637.....	138 + 1.	69.	23.	985.	225.
8786.....	144 + 1.	73.	23.		
9619.....	132 + 1.	71.	25.		
9986.....	138 + 1.	65.	23.		
13402.....	143 + 1.	73.	23.		
14656.....	146 + 1.	59.	25.	876.	189.
14674.....	138 + 1.	61.	23.		

Natrix fasciata sipedon Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimens.
1075	1	Westport, New York.....		Prof. S. F. Baird.....	Alcoholic type.
7817	2	Washington, District of Columbia.		do.....	do.
5216	1	Northern Alabama.....		W. M. Stewart.....	do.
4776	1	Fort Riley, Kansas.....		H. Brandt.....	do.
1089	2	New Harmony, Indiana.....		Col. B. C. L. Wallis.....	do.
5232	1	Neosho Falls, Kansas.....		B. F. Goes.....	do.
1091	2	Poland County, Ohio.....	—, 1853	Prof. S. F. Baird.....	do.
1064	6	Richland County, Ohio.....		Dr. P. R. Hoy.....	do.
1107	3	Columbus, Ohio.....			do.
1339	1	Nebraska.....		W. S. Wood.....	do.
1220	1	Norfolk, Virginia.....		Dr. F. V. Hayden.....	do.
1108	1	Salem, North Carolina.....		R. Kennicott.....	do.
1637	2	Southern Illinois.....		do.....	do.
1079	1	Framingham, Mississippi.....	—, 1858	C. Girard.....	do.
1110	1	Northeastern Wisconsin.....	—, 1858	A. C. Barry.....	do.
1069	1	St. Louis, Missouri.....		Dr. Geo. Engelmann.....	do.
1115	2	Tyree Springs, Tennessee.....		Prof. R. Owen.....	do.
1072	2	Racine, Wisconsin.....	—, 1863	Prof. S. F. Baird.....	do.
8789	1	Augusta, Georgia.....		William Phillips.....	do.
8786	1	do.....		do.....	do.
8780	3	Belleville, Illinois.....	Sept., 1874	Dr. A. Reuss.....	do.
8839	1	Rutherford County, Tennessee.		J. N. B. Scarborough.....	do.
9008	1	Montgomery, Alabama.....	July 13, 1876	Kumlien and Bean.....	do.
8987	2	Kinston, North Carolina.....		J. W. Milner.....	do.
9111	1	Wilmington, North Carolina.....		A. L. Kumlien.....	do.
9123	2	Raleston River, Virginia.....	May —, 1876	Kumlien and Bean.....	do.
9121	1	Milledgeville, Georgia.....	June 4, 1876	do.....	do.
9108	1	Marietta, Georgia.....			do.
1073	5	Carlisle, Pennsylvania.....		Prof. S. F. Baird.....	do.
9715	1	Washington, District of Columbia.	June 11, 1878	Dr. H. C. Yarrow.....	do.
10804	6	Virginia.....	—, 1881		do.
10002	1	Middletown, Connecticut.....	—, 1871	George Crafts.....	do.
9986	1	Westfield Falls, Connecticut.....	—, 1876	J. H. Pillsbury.....	do.
9619	1	Near Chain Bridge, Virginia.....	Apr. 28, 1878	Dr. T. H. Bean.....	do.
11414	1	Virginia.....	Sept., 1881		do.
11432	1	Potomac River, Georgetown, District of Columbia.		George Shoemaker.....	do.
9626	1	Arlington, Virginia.....	—, 1877	William Palmer.....	Cast.
9747	1	Four-mile Run, Virginia.....	—, 1878	Dr. T. H. Bean.....	do.
10054	1	Washington, District of Columbia.	—, 1878	Dr. R. Hessel.....	do.
396	1	Summerville, New York.....			do.
10696	1	Avoca, North Carolina.....	Apr., 1878	J. W. Milner.....	Alcoholic.
10648	1	Wheatland, Indiana.....	Apr., 1881	Robert Ridgway.....	do.
10438	1	District of Columbia.....	May —, 1880	C. Robinson, Jr.....	do.
10600	1	Naasville, Georgia.....	July 19, 1880	Wm. J. Taylor.....	do.
10334	1	Virginia.....	July 13, 1879	Henry Horan.....	do.
11142	1	Wheaton, Maryland.....	July 15, 1881	A. W. Smith.....	do.
10804	4	(?).....	—, 1881		do.
10822		Gainesville, Florida.....		James Bell.....	do.

Natrix fasciata sipedon Linnaeus—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimens.
10805	1	Washington, District of Columbia.	.....	Department of Agriculture.	Alcoholic.
1072	1	Racine, Wisconsin.....	— —, 1853	Prof. S. F. Baird.....	do.
1398	1	West Northfield.....	.....	R. Kennicott.....	do.
9144	2	Monticello, Mississippi.....	.....	Miss H. Tunison.....	do.
1363	1	Roanoke County, Virginia.....	.....	Charles Shoemaker.....	do.
9139	1	(?).....	.....	.....	do.
8790	1	Augusta, Georgia.....	.....	William Phillips.....	do.
8830	1	Franklin County, Tennessee.	.....	J. N. B. Scarborough.....	do.
8950	3	Ferry Landing, Virginia..	May 29, 1875	H. W. Welscher.....	do.
9009	1	Goldborough, North Carolina.	.....	A. L. Kumlén.....	do.
14856	2	Wheatland, Indiana.....	Nov. —, 1888	D. Ridgway.....	do.
12021	1	Mount Carmel, Illinois.....	.....	L. M. Turner.....	do.
14738	1	Rockland County, New York.	.....	Theo. Gill.....	do.
14429	1	Wytheville, Virginia.....	.....	M. McDonald.....	do.
12918	1	Des Moines, Iowa.....	.....	R. E. Call.....	do.
12915	1	do.....	.....	do.....	do.
14874	1	Current River, Missouri.....	.....	do.....	do.
14122	1	Anakotan Island, District of Columbia.	— —, 1885	Harry Simpson.....	do.
12350	1	Wheatland, Indiana.....	.....	Robert Ridgway.....	do.
12348	1	do.....	.....	do.....	do.
12349	1	do.....	.....	do.....	do.
18706	1	Cypress Creek, Alabama.....	.....	U. S. Fish Commission ..	do.
18707	1	(?).....	.....	do.....	do.
21243-5	3	Swan Creek, Padloque.....	.....	L. B. Thurber.....	do.
15459	1	Cherokee, North Carolina.	.....	James Mooney.....	do.
15576	1	Cedar Creek, Waterloo, Indiana.	.....	U. S. Fish Commission ..	do.
21688	1	Tiffin River, Hudson, Michigan.	.....	do.....	do.
21689	1	Sugar Creek, Lima, Ohio.....	.....	do.....	do.
21691	1	Maumee Basin, Ohio.....	.....	do.....	do.
14762	1	Des Moines, Iowa.....	.....	R. Ellsworth Call.....	do.
14766	1	Raccoon River, Des Moines, Iowa.	.....	do.....	do.
15241	1	District of Columbia.....	.....	H. W. Henshaw.....	do.
16999	1	Washington, District of Columbia.	.....	Dr. H. M. Smith.....	do.
17000	1	do.....	.....	do.....	do.
17126	1	Potomac River, Mount Vernon, Virginia.	.....	Frederick C. Test.....	do.
17312-15	1	Washington, District of Columbia.	.....	C. W. Richmond.....	do.
17322-26	1	do.....	.....	do.....	do.
17431	1	do.....	.....	do.....	do.
17458-60	1	do.....	.....	J. D. Figgins.....	do.
17962	1	Northern Indiana.....	.....	O. P. Hay.....	do.
18027	1	District of Columbia.....	.....	Kenneth F. Beal.....	do.
19048-50	1	Takoma Park, District of Columbia.	.....	Dr. R. W. Shufeldt.....	do.
19053	1	Washington, District of Columbia.	.....	W. F. Roberts.....	do.
21130	1	Cuyahoga River, Ohio.....	.....	U. S. Fish Commission ..	do.

This subspecies is characteristic of the Eastern region. There is considerable doubt whether it enters the Austroriparian fauna. If so, it appears sparingly, and only on the northern borders. Specimen Cat. No. 9008, from Montgomery, Alabama, might be almost as well placed with the *N. f. transversa*, as the belly is unspotted, but the anterior half of the body is cross banded as in the *N. f. fasciata*. Northwardly its range extends into New Brunswick. It is reported by Verrill as common at Norway, Maine.¹ It is the common "water snake" of the Middle States.

¹ Proc. Bos. Soc. Nat. Hist., 1863, p. 197.

NATRIX FASCIATA PLEURALIS Cope.

Scutellation as in the species generally; scales in twenty-three rows, the inferior more weakly keeled and of larger size than the others. Internasals longer than wide; oculars 1-3; middle of orbit above suture between fourth and fifth superior labials.

The color characters are quite peculiar. On the anterior part of the body brown bands cross the ground color reaching to the gastrosteges, the lateral parts having parallel sides, and being separated by spaces wider than themselves. The dorsal parts of these cross-bands gradually disappear and posterior to the middle or last third of the length are wanting, so that the coloration consists of lateral erect parallelogrammic spots separated by spaces of a yellow or gray ground color, equal to or a little wider than themselves. Belly yellow, with brown, rounded spots on the anterior parts of the gastrosteges; spots few on the anterior third in the type. Head brown without markings; labials lighter.

Cat. Nos.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
1092.....	131 + 1.	30†	23.	517.	120† (†injured).
8786.....	144 + 1.	73.	23.		
	136 + 1.	†	23.	1087 to anus.	— (injured).

This form is Austroriparian, but seems to be rare, as but two specimens have come under my observation. They approach the forms of *N. sipedon*, with lateral spots well separated.

The large specimen, Cat. No. 8786, referred to this subspecies, is so dark colored that the pattern is only made out when immersed in fluid. The belly also is marked by narrow transverse blotches on the external parts of the gastrosteges, which afterwards blend and involve the whole surface.

Natrix fasciata pleuralis Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimens.
1092	1	Mississippi.....	.....	Alcoholic.
8786	2	Augusta, Georgia.....	Wm. Phillips.....	do.

NATRIX FASCIATA TRANSVERSA Hallowell.

Tropidonotus transversus HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1852, p. 177.

Nerodia transversa BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 148.

Nerodia woodhousei BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 42; Reptiles U. S. Pac. R. R. Surv., X, 1859, Whipple's Report, p. 41.

Dorsal rows of scales twenty-five, all carinated. Three series of subquadrate black blotches, a dorsal and two lateral, the latter vertically elongated. A double yellow occipital spot. A yellow spot between the superciliaries and frontal plates. A black vitta from posterior rim of eyes to angle of mouth.

The head is broad behind and tapers forward, very much flattened above. The labials are eight above and eleven below; the fifth, sixth, and seventh the largest on both jaws.

Ground color dusky, with a dorsal series of subquadrangular brown blotches, alternating with the lateral series as far as the head; with anterior and posterior margins nearly parallel, rarely tapering downward and reaching the abdominal scutellæ. The fuscous space between the lateral blotches is wider than that occupied by the blotches themselves. Along the tail both the dorsal and lateral blotches are small and subcircular. Underneath the color is yellowish, and the scutellæ in the young margined posteriorly with black, while in the adult the middle region of the scutellæ is unicolor. The head is brownish-black,

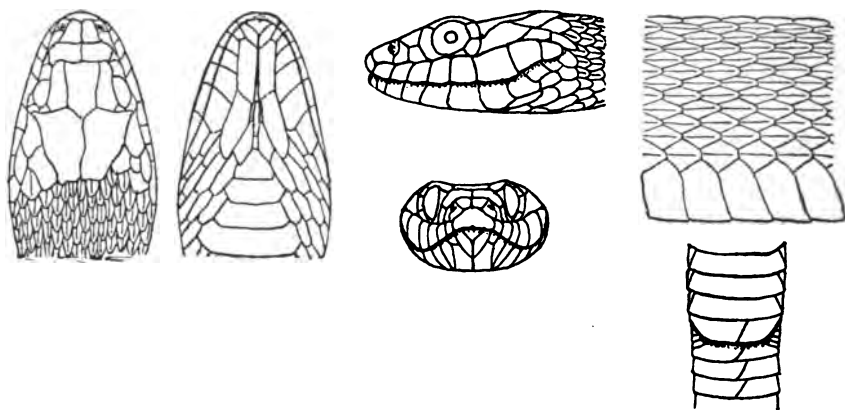


Fig. 252.

NATRIX FASCIATA TRANSVERSA HALLOWELL

=1.

with a double yellow spot near the commissure of the occipital plates, and two spots of the same color on the commissural line between the vertical and supercilliaris. A black vitta extends from the posterior rim of the eye to the angle of the mouth.

This form has normally two more rows of scales than the subspecies *fasciatus* and *sipedon*. The alternation of the dorsal and lateral spots is more universal than in either of them, while the unspotted abdomen relates it to the subspecies *N.f. erythrogaster* of the same geographical region.

Cat. Nos.	Gastrosteges.	Urosteges.	Scales.
1316 (type)	148 + 1.	83.	23.
1308	143 + 1.	†.	25.
1323	157 + 1.	62.	25.
†	144 + 1.	67.	25.
1327	147 + 1.	66.	25.

Natrix fasciata transversa Hallowell.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimens.
1327	2	New Braunfels, Texas	-----	F. Lindheimer	Alcoholic.
1328	1	-----	-----	-----	do.
1308	1	Indianola, Texas	-----	Col. J. D. Graham, U. S. A.	do.
1333	1	Rio Pecos, Texas	-----	Capt. John Pope, U. S. A.	do.
1318	1	Antelope Creek	-----	H. B. Mollhausen	do.
1323	2	Fort Smith, Arkansas	-----	Lieut. A. W. Whipple, U. S. A.	do.
1316	1	Creek boundary	— —, 1858	Wurdeman	Alcoholic type.
21492	-----	Hot Springs, Arkansas	-----	H. H. and C. S. Brimley	do.
22324	-----	Guadalupe River, Kerrville, Texas.	-----	Hy. Caudlin	do.
22325	-----	Quinlan Creek, Kerrville, Texas.	-----	do.	do.

This form is restricted to Texas and adjacent regions, where it is abundant.

NATRIX FASCIATA ERYTHROGASTER Shaw.

Natrix fasciata erythrogaster COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 392.

Coluber erythrogaster SHAW, Gen. Zoology, III, 1802, p. 458.—HOLBROOK, N. Amer. Herpt., II, 1838, p. 91, pl. XIX.

Tropidonotus erythrogaster HOLBROOK, N. Amer. Herpt., 2d ed., III, 1842, p. 33, pl. VIII.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 570.

Nerodia erythrogaster BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 40.

Tropidonotus sipedon erythrogaster COPE, Check-list N. Amer. Batr. Rept., 1875, p. 43.

Tropidonotus fasciatus var. *erythrogaster* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 244.

Head elongated, narrowing forward. Gastrosteges most numerous of all the subspecies of the *Natrix sipedon*. Three postorbitals. An elevated loreal. Dorsal rows of scales, twenty-three, sometimes twenty-five, in number, all very strongly carinated. Uniform dark bluish black above, lighter on the sides; a lateral or external band of dull blue extending on the abdominal scutellæ. Body beneath (in alcohol) uniform dull yellow, tail bluish.

The head is proportionally narrow and elongated, flattened above and convex on the snout. The frontal plate is elongated and sub-pentagonal, broader anteriorly than posteriorly, with the sides slightly concave. The postorbital plates, proportionally small, are three in number. Loreal large and polygonal, higher than long. There are three or four temporal shields very much developed, but one in contact with postorbitals. Dorsal rows of scales twenty-three or twenty-four in number, strongly carinated with the keels on the posterior third of the body, constituting very conspicuous and continuous ridges, the intermediate depressions or furrows giving to the body and tail a canaliculated appearance. The lateral or outer row, however, is but slightly carinated. The tail itself is subconical, very much tapering, forming one-fourth of the entire length.

The color in life is said to be brick-red above, tinged with green on the sides, and uniform copper color beneath.

Cat. Nos.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
1314 (type of <i>N. couchii</i>)	150 + 1.	85.	25.		
1319	154 + 1.	71.	25.		
10732	124 + 1.	74.	24.	898.	242.
12030	154 + 1.	79.	23.		
12992	150 + 1.	64.	25.		
13353	150 + 1.	(†)			
13572	134 + 1.	(†)	23.		

As may be derived from the above, I can not distinguish specimens from Nueva Leon in northeastern Mexico, types of *Nerodia couchii* Baird and Girard, from the *N. f. erythrogaster*.

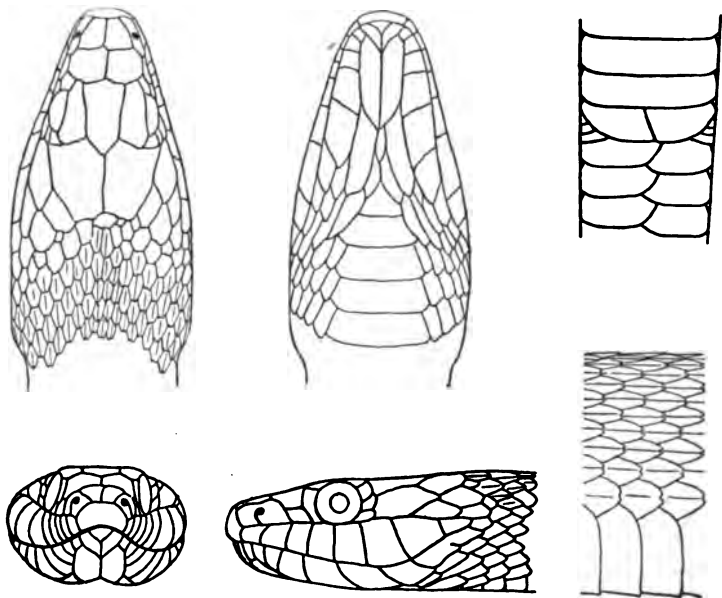


Fig. 253.

NATREX FASCIATA ERYTHROGASTER SHAW.

= 1.

Jackson, North Carolina.

Cat. No. 1347, U.S.N.M.

A singular form of this subspecies was taken by Dr. H. C. Yarrow in Virginia (Cat. No. 13572). It is steel gray above, and dirty white below, the belly with gray punctulations increasing in density posteriorly. Traces of dark gray spots on the ends of the gastrosteges, most distinct on the posterior third of the length. No head markings. Another peculiar specimen is Cat. No. 10732, from Florida, in which district the subspecies seems to be rare. The median dorsal line is crossed by pairs of dark brown cross-bands, the spaces they inclose representing the spaces between the spots of the *N. s. sipedon*. They

are more numerous than in that subspecies, numbering thirty-six to the vent. No trace of lateral spots.

Natrix fasciata erythrogaster Shaw.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1346	1	Cat Island, Georgia .....	.....	Maj. W. H. Emory, U. S. A.	Alcoholic type.
1118	1	Prairie Mer Rouge, Louisiana.	.....	Jas. Fairie	do.
424	1	New Orleans, Louisiana..	.....	.....	do.
1655	1	Southern Illinois .....	.....	R. Kennicott	do.
1155	1	Charleston, South Carolina	.....	Dr. S. P. Barker	do.
1347	1	Jackson, North Carolina..	.....	Fitzgerald	do.
1844	1	Natchez, Mississippi .....	.....	.....	do.
1320	1	Near 38° lat. ....	.....	Lieut. E. G. Beckwith, U. S. A.	do.
1351	1	Saint Louis, Missouri .....	.....	Dr. Geo. Englemann	do.
1341	1	Lansing, Michigan .....	.....	Rev. C. Fox	do.
8308	1	Colorado and Zuni Survey.	—, 1849	Capt. L. Sitgreaves, U. S. A.	do.
1350	1	Lake Huron .....	.....	Prof. L. Agassiz	do.
9007	1	Kinston, North Carolina..	.....	H. E. Quin	do.
9025	1	Mandeville, Louisiana	May —, 1877	G. Kohn	do.
9984	1	Westfield Falls, Connecticut.	.....	F. D. Skul	do.
8362	1	Kinston, North Carolina..	May —, 1875	H. W. Welsher	do.
12030	1	Mount Carmel, Illinois....	Nov. —, 1881	L. M. Turner	do.
10732	1	Gainesville, Florida	July —, 1880	James Bell	do.
1319	1	Santa Caterina, Nueva Leon, Mexico.	.....	Lieutenant Couch, U. S. A.	Alcoholic type of <i>N. couchii</i> .
1314	1	San Diego, Nueva Leon, Mexico.	.....	do	do.
12992	2	New Orleans, Louisiana .....	.....	R. W. Shufeldt	do.
15351	.....	Southern Illinois .....	.....	Dr. D. W. Prentiss	do.

While this subspecies is characteristic of the Austroriparian district, there is no doubt that it is also found in the State of Michigan.

NATRIX BISECTA Cope.

Tropidonotus bisectus COPE, Proc. U. S. Nat. Mus., XI, 1887, p. 146.

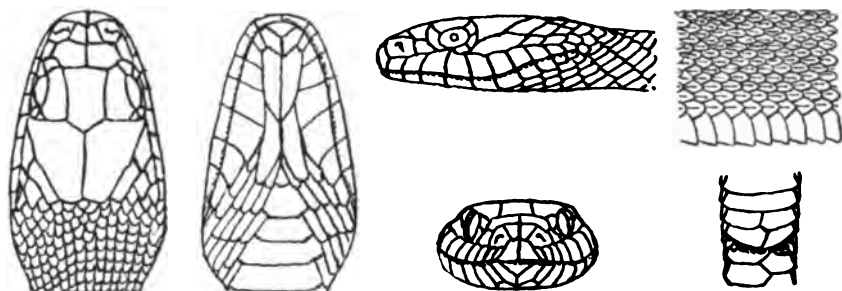


Fig. 254.

NATRIX BISECTA COPE.

× 2.

Washington, District of Columbia.

Cat. No. 14643, U.S.N.M.

Scales in twenty-five longitudinal rows, all keeled. Form moderately robust. Internasals nearly triangular; prefrontals wider than long; frontal with parallel sides, which are longer than the anterior border.

Rostral broad, low, divided in two by a vertical suture. Loreal higher than long. Oculars 2-3, the superior anterior shorter than the inferior; the inferior posterior so produced forward as to exclude the fifth superior labial from the orbit. Superior labials nine, the fourth only entering the orbit. Temporals 1-3, the superior of the second series elongate.

The color is olive-brown above, dirty white below. There is a row of blackish spots along the sides, of small size, which cover the adjacent parts of three scales of the first and second rows, and which are separated by an interspace of one and a half scales. These spots are wanting from the anterior fourth of the length. Above the interval between them there is, on each side, a longitudinal dusky spot, which is entirely separate from that of the opposite side, and which is separated from the adjacent ones by a space of a lighter brown than the ground color. These longitudinal spots begin at the head and disappear near the middle of the length, after acquiring a tendency to extend obliquely downward and backward. Head without marks, except three pale spots on the parietals; one on each side of the median suture, and one at the angle of the frontal. Belly unicolor, except at the lateral spots, which extend over the posterior angle of the gastrosteges. Inferior surface of tail black-speckled.

Cat. No. 14643; gastrosteges, 143 + 1; urosteges, 67; length, 271 mm.; tail, 66 mm.

A single specimen of this species was found in the grounds adjacent to the central station of the United States Fish Commission in the heart of the city of Washington, and no second one has been obtained. It is a singular circumstance that this species should have remained so long unknown. By its scutellation and color pattern it is absolutely distinct from any other species of the genus, either of America or any other country. It is probably one of the rare species like the *N. rigida* and the *Hyla andersonii*, which are only seen at long intervals.

Natrix bisecta Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
14643	1	Washington, D. C.....	J. B. Brown.....	Alcoholic.

NATRIX COMPRESSICAUDA Kennicott.

Natrix compressicauda COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 392.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 238.

Tropidonotus compressicaudus COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 74.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 42.

Nerodia compressicauda KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 335.

Scales in rows from nineteen to twenty-one, all keeled. Oculars, one to three; temporals, one, two, or three. Superior labials, eight, fourth and fifth entering orbit. Tail compressed and elevated at the base. Above light yellowish brown, with brown spots or cross bands. Below brown, with a median series of rounded yellow spots, extending from

the throat to the tail. Size smaller than the *N. sipedon* and allied species. Base of tail compressed.

This species, although restricted to the peninsula of Florida in its range, presents us with four subspecies, which differ greatly in coloration. They are defined in the following table:

Scales in 19 rows; above blackish brown, with numerous closely placed cross-bands.

N. c. compsolenma.

Scales in 21 rows; four series of longitudinal spots above, those of the median pair forming two longitudinal stripes on the greater part of the length; the laterals forming stripes on the neck only..... *N. c. taniata.*

Scales in 21 rows; numerous dark cross bands, which are resolved into three rows of spots just anterior to the tail, and four longitudinal stripes on the neck.

N. c. compressicauda.

Scales in 21 rows; sooty above, with transverse bands anteriorly *N. c. obscura.*

Scales in 23 rows; yellowish, with narrow brown cross bands; no postocular band.

N. c. walkerii.

The yellow colors are brighter in the smaller individuals, and the dark color of the inferior surfaces is darker. The ends of the gastroteges have a yellow spot, which becomes wider in older individuals, reducing the extent of the dark ground to a stripe-like shade.

NATRIX COMPRESSICAUDA COMPRESSICAUDA Kennicott.

Natrix compressicauda compressicauda COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 392.

Nerodia compressicauda KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 335.

Natrix compressicauda bivittata COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 392.

Body moderately stout, with subtriangular section, compressed toward the tail, where it is considerably higher than broad. Head elongate, rather narrow, but very deep. Plates of the crown large; frontal short, very broad; loreal small; three postorbitals, upper and lower small. Twenty-one rows of dorsal scales, all carinated; in form rather wide, those of the first rows proportionally small. Ground color yellowish olive; four black stripes on the neck; behind this zigzag transverse black bands, which do not taper on the sides. Posteriorly these bands break into three series of spots symmetrically arranged, not alternating.

Body rather stouter than

T. sipedon, and presenting a subtriangular form. This is more evident posteriorly, where and on the tail the height is much greater than the transverse diameter. The tail is very large at the base, as in *N. rhom-*

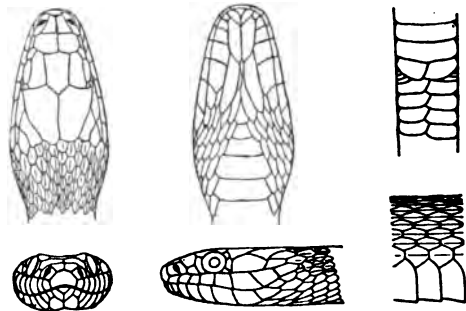


Fig. 255.

NATRIX COMPRESSICAUDA COMPRESSICAUDA KENNICOTT.

=1.

Type.

Tampa Bay, Florida

Cat. No. 1348, U.S.N.M.

bifer, and does not taper from the anus, but narrows abruptly at one-third its length from the base. Dorsal rows twenty-one, all distinctly carinate. The scales are rather broad and much rounded posteriorly, those of the first dorsal row disproportionately small. The head is elongate and rather narrow posteriorly, but very deep and but little depressed on the snout. All the plates of the crown are large; the frontal very broad and short, the loreal longer than high, the upper and lower postorbitals small, but the central elongated so as to reach the labial plates.

The ground color is light olive brown, crossed on the anterior half of the body by wavings or somewhat zigzag transverse black bands, covering two or three scales longitudinally, and separated by intervals of one or two scales. These bands do not taper regularly on the sides, as in *T. sipedon*, but are constricted upon the sixth row on each side, but are wide upon the third, as upon the vertebral row. Posteriorly these bands become narrower, and finally break up into a dorsal series of vertically elongated spots, and a lateral series of small circular ones, which do not alternate with the dorsal series, as in *N. f. sipedon*, *taxispilota*, and others. For two inches behind the head the transverse bands are replaced by four distinct longitudinal black lines, the lateral ones covering the third, fourth, and part of the second rows, the upper ones covering the seventh, eighth, ninth, and part of the tenth rows; these black lines are separated by a little over one scale of ground color. None of the black markings involve the first dorsal row, which is yellowish olive, excepting some irregular dark mottlings. The head is yellowish olive, with the middle of the parietals and frontal and a patch extending from the eye back above the labials black. The rostral is yellow, distinctly margined above with black. All the labials above and below, and the inframaxillary plates are yellow, prominently margined with black. The abdomen is yellow, with two lines of black blotches.

Cat. Nos.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.
1348	125 + 1.	63.	540.	133.
13659	131 + 1.	93.		
13687	126 + 1.	80.		

Some specimens from Georgiana, Florida, present the following characters: They represent the supposed form *bivittatus*, but are only young of the typical form. Head oval, distinct from neck; tail long, moderately compressed at base; less than in types. Rostral plate elevated; internasals longer than wide; frontal elongate and with parallel sides. Loreal oblique, longer than high; oculars, 1-3, the inferior posterior not below the orbit, but nearly cutting the fifth superior labial out of its border. Temporals, 1-3; superior labials, eight; middle of orbit above suture between fourth and fifth. Inferior labials, ten; postgenaeals larger than pregenaeals. Scales of body in twenty-one series, all keeled.

Ground color above, light brownish ash; below, light yellow. The

former region is crossed in the typical specimen by thirty-six blackish-brown crossbars, which are wide and close together on the median dorsal region, and tapering, and therefore separated on the sides. The dorsal parts of the spots unite and form two wide longitudinal bands on the anterior fifth of the length. A pale brown band passes from the superciliary plate to the side of the neck, leaving a dark postorbital band below. All the plates of the lips and throat are yellow, and have narrow black borders. On the yellow of the belly there are black spots on the gastrosteges which incline to fuse transversely, leaving a part of the ground visible in the middle. Anteriorly this arrangement assumes the form of two longitudinal black bands, which are well defined on the anterior fourth of the length, leaving a yellow band between and one on the outer side of them.

Cat. No. 13659; gastrosteges, 131 + 1; urosteges, 93; length, 336 mm.; tail, 97 mm.

Natrix compressicauda compressicauda Kennicott.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1848	1	Tampa Bay, Florida .....	.....	David Welsh	Alcoholic type.
13659	1	Georgiana, Florida	 1883	William Wittfield	do.
13687	1	do	 1883	do	Alcoholic, <i>bivittata</i> .
13692	1	do	 1893	do	Alcoholic.

NATRIX COMPRESSICAUDA TÆNIATA Cope.

Natrix compressicauda tæniata COPE, American Naturalist, 1895, p. 676.

Scales in twenty-one rows; four series of longitudinal spots above, those of the median pair forming two longitudinal stripes on the greater part of the length, the laterals forming stripes on the neck only.

Labials, eight to ten; oculars, 1-3; temporals, 1-3. Frontal narrow, not widened anteriorly; parietals rather wide. First row of scales keeled. Gastrosteges, one hundred and thirty-one; anal, 1-1; urosteges, eighty-two. The lateral black spots extend as far as the tail. The dorsal stripes are connected by a transverse lighter brown shade for a short distance in advance of the vent. Belly black, with a median series of semidiscoid yellow spots; gastrosteges with yellow extremities for the anterior two-thirds of the length of body. The median neck spots touch on the nape of the neck, and after inclosing a pale space unite on the parietal plates. Muzzle brown, the labials with blackish shades. Lower labials, genaeals, and gulars with yellow spots. Indistinct parietal paired spots.

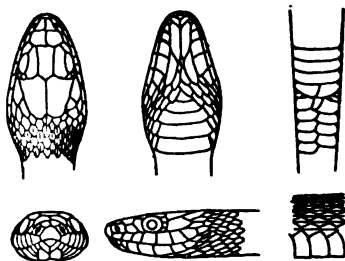


Fig. 256.

NATRIX COMPRESSICAUDA TÆNIATA COPE.

= 1.

Volusia, Florida.

Collection of E. D. Cope.

Measurements.—Total length, 378 mm.; tail, 98 mm.

Two specimens in my private collection from Volusia, Florida.

In this form the striping which appears on the neck of the form *compressicauda* is extended the entire length. It bears thus a partial resemblance to the *Natrix clarkii*, which is not far removed in affinity from the *N. compressicauda*. The form described as *N. fasciata pictiventris* connects *N. compressicauda* with the *N. fasciata*.

NATRIX COMPRESSICAUDA WALKERII Yarrow.

Tropidonotus compressicaudus walkertii YARROW, Proc. U. S. Nat. Mus., VI, 1883, p. 154.

The scuta of this subspecies are quite as in the last; as in the form of the rostral, internasal, and frontal plates and the relation of the orbit to the superior labials. Its chief peculiarities are in its twenty-three rows of dorsal scales, and in its coloration. In the latter it approaches the

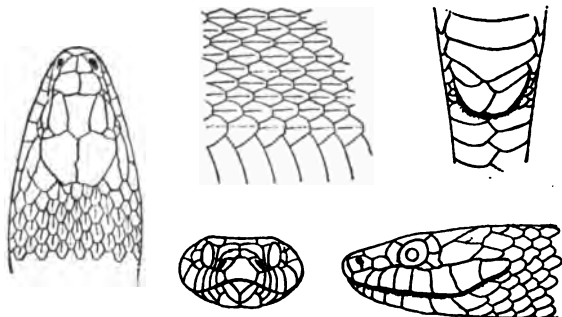


Fig. 257.

NATRIX COMPRESSICAUDA WALKERII YARROW.

= 1.

Clearwater, Florida.

Cat. No. 10681, U.S.N.M.

N. c. compsolæma. Color above brownish yellow, crossed by numerous brown crossbars which are as wide as the spaces which separate them—namely, two scales—and which extend to the first row of scales. These bars become wide on the part of the body near the head, and are split by the ground color without forming bands, except two short ones which form a V on the parietal plates. No postorbital band. Labials dusky, yellow bordered in front; genials the same, with a large median yellow spot on each. Abdomen dusky with a median row of round yellow spots, which soon become irregular in number and position. Ends of gastrosteges yellow on the anterior fifth of the length.

Cat. No. 10681 (tail injured); gastrosteges, 137 + 1; length, 467 mm.

In the absence of the longitudinal stripes on the superior surface posterior to the head, this form differs materially from the typical form.

Natrix compressicauda walkeri Yarrow.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
10681	1	Clearwater, Florida.....	S. T. Walker.....	Alcoholic.

NATRIX COMPRESSICAUDA OBSCURA Lænnberg.

Natrix compressicauda obscura LÆNNBERG, Proc. U. S. Nat. Mus., XVII, 1894, p. 330.

I have not seen this form. It is thus described by Dr. Lænnberg:

Scales in twenty-one rows. The color of the back is dark bluish gray, "soot color." On this ground the three series of spots can scarcely be distinguished, except on the anterior part of the body where they form transverse bands; the head is too dark to show any postocular bands; upper and lower labials, as well as mentals, with yellowish spots; the ground color of the belly is gray, a little reddish. On each side on the dorsal margin of the gastrosteges there is a small light spot; a median black band extends from the first gastrosteges to the tip of the tail. On the anterior part there is a yellowish spot on each gastrostege in this black band, and the thirty anterior spots cover this band nearly completely, but farther back they become smaller and less distinct, disappearing on the tail.

From Key West, Florida.

NATRIX COMPRESSICAUDA COMPSOLÆMA Cope.

Tropidonotus compsolæmus COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 368.

Scales in nineteen longitudinal rows, and keeled. Rostral plate twice as broad as high. Prefrontals subtriangular; loreal longer than high. One rather narrow preocular; postoculars three, the lowest very small. Vertical and superciliaries elongate; lateral border of the former scarcely converging; the latter narrow. Superior labials eight; fourth and fifth entering the orbit. Inferior labials nine. Tail slender, slightly compressed at the base, three-tenths of the total length. Gastrosteges, 126; a divided anal; urosteges, 67.

Measurements.—Total length, 400 mm.; tail, 86 mm.

Above, blackish brown, darkest anteriorly. Very indistinct pale transverse bands are apparent. They are irregularly oblique and separated by intervals of two or three scales wide. Superior and inferior labials more or less completely margined anteriorly with yellow; genaeal and gular plates spotted irregularly with the same. General color beneath a peculiar stone brown. A darker shade occupies the center of the gastrosteges as far as the vent. This is almost excluded anteriorly by a central series of transversely elliptical yellow spots, one near the anterior border of each gastrostege. These become narrower and broken, and upon the posterior two thirds of the belly are almost lost. There is a very indistinct row of smaller spots upon each side of it anteriorly.

This species should be compared with *N. f. sipedon* and *N. valida*. It differs from the first in the numbers of rows of scales, and from all three in the form of the muzzle and coloration of the lower surface.

The only known specimen of this subspecies was found at Key West, Florida, and is preserved in the Museum of Comparative Zoology, Cambridge, Massachusetts.

NATRIX VALIDA Kennicott.

Regina valida KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 334.

Tropidonotus validus BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 237.

Scales in twenty-one rows, the inferior smooth. Head distinct from body, elongate and tapering to the muzzle. Internasals longer than wide; rostral elevated. Oculars 2-3 and 1-3; temporals 1-2. Superior labials eight, eye over fourth and fifth. Tail not compressed at base; gray or brown, with more or less distinct small spots on the sides. Belly not spotted.

There are two subspecies of the *Natrix valida*, as follows:

Spots small, no bands; belly pale..... *N. v. valida*.

Lateral spots large; a vertebral dark and lateral light band; belly dark;

N. v. celano.

NATRIX VALIDA VALIDA Kennicott.

Regina valida KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 334.

Tropidonotus validus COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 310; Check-list

N. Amer. Batr. Rept., 1875, p. 42; U. S. Geog. Surv. W. 100th Mer., 1875, p. 612, pl. XXI.

Tropidonotus tephroleura COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 341.

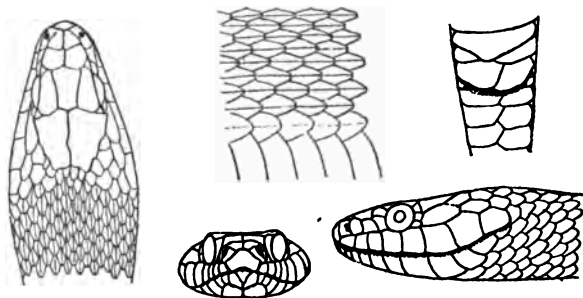


Fig. 258.

NATRIX VALIDA VALIDA KENNICOTT.

=1.

Rabeh Valley, Utah.

Cat. No. 4650, U.S.N.M.

Body stout; head large, short but high; broad posteriorly. Snout elongated, narrow, and pointed. Rostral as high as broad, subpentagonal, the apex pointed. Frontal very narrow, obtusely pointed posteriorly; parietals small. Nineteen (sometimes twenty-one) rows of scales, all carinated except the exterior. Light brownish ash above, with faint black markings upon the bases of the scales of the first, fourth, and eighth rows of scales. Abdomen entirely uniform yellowish.

The tail is rather short. The head is very large and proportionally

stout. It is very broad and high posteriorly, and tapers regularly to the snout, which is rather narrow, elongated, and pointed. Snout elevated, rostral plate as high as wide, subpentagonal, and with the elongated apex pointed. Loreal nearly as high as long. Internasals triangular, elongated. Frontal very narrow, not widening anteriorly, the posterior point very obtuse. Superciliaries proportionally wide, and occipitals small. There are indifferently one or two preorbitals and two large postorbitals, rarely three. Upper labials large, sixth and seventh largest, eighth (the last) smaller. Inferior labials ten, sixth longest.

The dorsal rows are nineteen, all carinated, the outer row very slightly. The scales of the first row are much the largest; all the rest about equal.

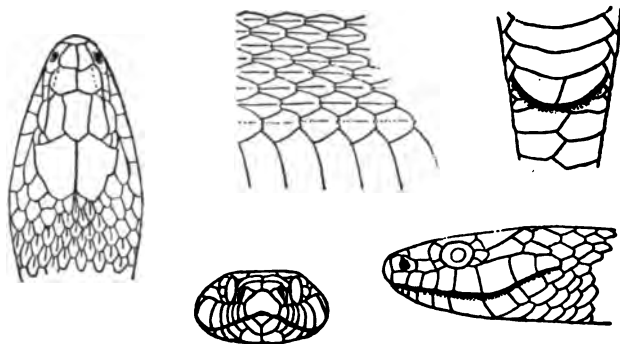


Fig. 250.

NATRIX VALIDA VALIDA KENNICOTT.

=1.

La Paz, Lower California.

Cat. No. 12642, U.S.N.M.

The color above is entirely uniform light brownish ash (clay color beneath epidermis), with about every alternate scale on the fourth and fifth rows marked with black on each side near its base. Posteriorly the scales of the first row are faintly marked with black at their bases. These black markings are not prominent and only perceptible upon close examination. The head, including the upper labials and rostral, has more of an olivaceous cast. The abdomen is entirely uniform pale grayish yellow, the tips of the scutellæ being, however, tinged with the ashy brown color of the back.

Cat. Nos.	Gastrosteges.	Urosteges.	Length.	Tail.
			mm.	mm.
4650	157 + 1.	81.		
4683	145 + 1.	78.	937.	250.

Natrix valida valida Kennicott.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4650	1	Rabeh Valley, Utah.....	.....	Capt. J. H. Simpson, U. S. A.	Alcoholic.
4683	4	Cape St. Lucas, Lower California.	.....	John Xantus.....	do.
1309	1	Durango, Mexico .....	.....	Dr. Thos. H. Webb	do.
12642	5	La Paz, L. California.....	Feb. —, 1881	L. Belding.....	

NATRIX VALIDA CELÆNO Cope.

Tropidonotus celæno COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 341.

Scales in nineteen or twenty-one rows, all carinate except the first. Head broad and distinct posteriorly, constricted at the orbits, and remarkably narrow anteriorly. Profile of the crown slightly but regu-

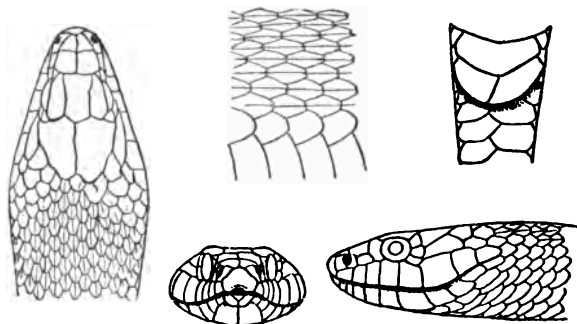


Fig. 260.

NATRIX VALIDA CELÆNO COPE.

—1.

Cape St. Lucas, Lower California.

Cat. No. 5281, U.S.N.M.

larly convex. Superciliary plates narrow and elongate. Vertical elongate, its lateral borders concave, not convergent posteriorly, its length greater than that of the occipital suture. Frontals small, the anterior almost triangular. Nasals and loreal rather large, the posterior border of the latter very oblique. Preocular one, postoculars three, superior labials eight, eye resting on the fourth and fifth, sixth and seventh largest and bounded above by the first temporal. Remaining temporals four on each side. Inferior labials ten, sixth longest. Posterior geneials longer than the anterior. General form rather slender, tail one-fifth the total length. Gastrosteges, 145; one divided anal; urosteges, 71.

The general color is leaden black above and below, with the following paler markings: A band of leaden gray begins upon the neck, occupying the second, third, and part of the first rows of scales. This extends to the anus, becoming darker and leaving the first row of scales poste-

riorly. Upon the anterior third of the body irregular narrow vertical bands extend from this, separated by black spaces of one and a half or two scales in width, which spaces are sometimes inclosed by the confluence of the bands on each side of the black vertebral line.

This subspecies may be distinguished from those called *Eutania* by Baird and Girard by its divided postabdominal scutellæ. It, however, bears quite a close resemblance to some of them, for example, *E. pickeringi*.

Cat. Nos.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.
5281	140 + 1.	72.	700.	180.
	154 + 1.	71.		

Natrix valida celæno Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
5281	6	Cape St. Lucas, Lower California.....	John Xantus	Alcoholic.

NATRIX CLARKII Baird and Girard.

Regina clarkii BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 48.

Tropidonotus clarkii COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 74; Check-list N. Amer. Batr. Rept., 1875, p. 42.—BOULENGER Cat. Snakes Brit. Mus., I, 1893, p. 238.

Tropidonotus medusa GÜNTHER, Cat. Colubr. Snakes Brit. Mus., 1858, p. 78.

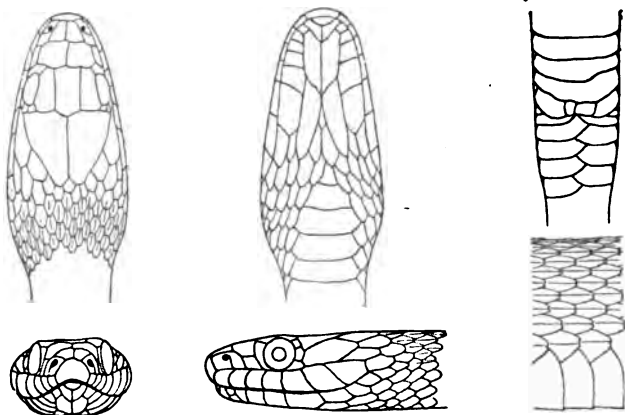


Fig. 261.

NATRIX CLARKII BAIRD AND GIRARD.

= 1.

Lake Catherine, Louisiana.

Cat. No. 16677, U.S.N.M.

Yellowish brown, with four longitudinal bands of deeper brown. Abdomen dull yellow, with two clouded brown bands dotted with black. One anteorbital. Dorsal rows of scales twenty-one, all carinated.

Head elongated, conical from occiput to the extremity of the snout, depressed above, subconcave on the occipital region, slightly sloping on the snout. Cephalic plates very much developed. Frontal subpentagonal, broader anteriorly, though slightly tapering. Internasals quite large. Three, or sometimes only two, postorbitals, variable in comparative size; when there are three the lowermost is suborbital. One anteorbital, large. Loreal well developed, longer than high. Upper labials eight, fifth and sixth largest, the latter very large. Scales of the body elliptical, rounded posteriorly in twenty-one rows. Outer row somewhat larger than the rest and very slightly carinated.

Color of head dirty brown, occipital and temporal region blackish. Each of the four longitudinal bands of deep brown covers two rows of scales. The intermediate yellowish brown spaces embrace each two rows of scales also, except the dorsal one, which has three rows. Each of the abdominal clouded bands embraces one-fourth of abdominal space, inside of which is left a yellow space one-fourth of the width and exteriorly another yellow space one-eighth of the width of abdominal space. The tail beneath is blackish, owing to the confluence of the abdominal bands, interspersed with yellowish maculæ.

This is the western representative of the Floridian *N. compressicauda*, and, like it, the basal part of the tail is compressed, but not to so high a degree. Its head is more acuminate than in either that species or the *N. valida*. The coloration of the belly is a good deal like that of the *N. compressicauda*, but the dorsal striation is totally distinct. However, a beginning of this character also may be seen on the anterior part of the Floridian species, for the dorsal spots are split, and their halves unite into two longitudinal bands.

Cat. Nos.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.
2264	132 + 1.	57.	790.	178.
1392	135 + 1.	68.		

Natrix clarkii Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2264	2	Indianola, Texas	Col. J. D. Graham, U. S. A.	Alcoholic.
1377	1	do	Dr. C. B. R. Kennerly	do.
1392	1	do	Col. J. D. Graham, U. S. A.	do.
16677	1	Lake Catherine, Louisiana.	G. Kohn	do.

Numerous specimens of this species were collected by Mr. Julius Hurter, of St. Louis, on the islands off the coast of Florida, at Pensacola, giving the species a much wider range than was originally attributed to it.

NATRIX RIGIDA Say.

Coluber rigidus SAY, Journ. Acad. Nat. Sci. Phila., 1825, IV, p. 239.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 355.

Tropidonotus rigidus HOLBROOK, N. Amer. Herp., 1842, III, p. 39, pl. x.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 42.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 240.

Greenish brown above; two deep brown vittæ along the dorsal region. Contiguous edges of the outer row of scales and abdominal scutellæ finely margined with brown. The middle region of the outer row like the abdomen, as is that of the second row, but less distinctly. Abdomen reddish yellow, with two series of black spots on the middle region, approaching each other toward the anterior region of the body. Dorsal rows of scales nineteen, carinated except the outer row, which is smooth.

Head proportionately larger than in *R. leberis*, much less depressed and shorter on the snout. Its upper surface is flat, the snout convex, the high and large rostral making it less sloping. Front plate subhexagonal and elongated. Parietals truncated posteriorly. Superciliaries narrow and tapering forward. Anterior pair of frontals very small. Two post-orbitals of nearly equal size, and two anteorbitals, the upper one much larger than the lower. Loreal subcircular or oblong. An elongated and narrow temporal shield, followed by two or three smaller. Upper labials seven, fifth and sixth very large. Lower labials eleven, sixth and seventh largest. Scales elliptical, narrower along the middle line of the back, carinated, except the outer row, which is perfectly smooth, and furthermore distinguished by the scales having their height greater than their length. The second row is noticeable for its size, and sometimes for its want of carination, which in all cases is obsolete.

The ground-color is uniform greenish brown, but each scale on the flanks is marked with a small blotch of deeper brown at its base. The brown vittæ of the back cover each one entire row and the half of the two adjoining rows, separated on the dorsal line by one row and two half-scales of the ground-color. Beneath dull yellowish. Along the middle region of the abdomen there are two series of elongated deep brown blotches approaching each other toward the anterior region and under the tail, sometimes, however, not extending beyond the anus.

The ground-color is uniform greenish brown, but each scale on the flanks is marked with a small blotch of deeper brown at its base. The brown vittæ of the back cover each one entire row and the half of the two adjoining rows, separated on the dorsal line by one row and two half-scales of the ground-color. Beneath dull yellowish. Along the middle region of the abdomen there are two series of elongated deep brown blotches approaching each other toward the anterior region and under the tail, sometimes, however, not extending beyond the anus.

This species approaches near to the *N. grahamii*, but differs in the

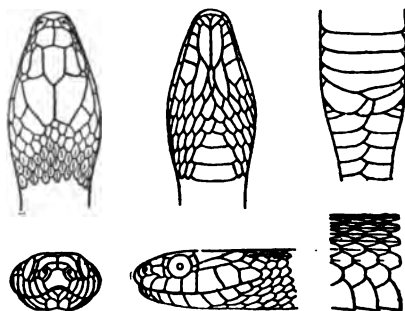


Fig. 262.

NATRIX RIGIDA SAY.

= 1.

Georgetown, South Carolina.

Cat. No. 1287, U.S.N.M.

only adult specimen at my disposal in the very short muzzle, and long parietal shields, and absence of the lateral yellow band, with the presence of a median dark dorsal band. From *N. leberis* it may be readily distinguished as to squamation, by the absence of keel on the first row of scales, and the rather wider lateral scales. In a small specimen from Palatka, Florida, the large loreal reaches the orbit by an angle between the two preoculars.

Cat. Nos.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.
1387.....	137 + 1.	58.	560.	115.
1379.....	135 + 1.	56.		
7215.....	135 + 1.	71. ¹		
†.....	132 + 1.	52. ¹		

Natrix rigida Say.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
7215	1	Southern States		Rev. J. J. Morris	Alcoholic.
1387	1	Georgetown, South Carolina.	— —, 1855	Weston	do.
1379	1	Riceboro, Georgia		Dr. W. L. Jones	do.
17389	1	Palatka, Florida.....		C. W. Richmond.....	do.

NATRIX USTA Cope.

Natrix usta COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 392.

Tropidonotus ustus COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 340.

Tropidonotus compressicauda BOULENGER, part, Cat. Snakes Brit. Mus., I, 1893, p. 238.

Scales in twenty-one longitudinal rows, all carinate, those of the first faintly; those of the second row not larger than the vertebral. Head narrow, not depressed, the end of the muzzle slightly elevated. Lateral borders of the frontal plate slightly concave, not convergent posteriorly. Internasals small. Nostrils in the superoposterior angle of the prenasal plate. Loreal longer than high. Preocular single; two postoculars. Superior labials eight, fourth and fifth bounding the orbit. Lower postocular in contact with the parietal and a larger temporal plate, which extends to the eighth labial. A second large and three small temporals border the parietals exteriorly. Ten

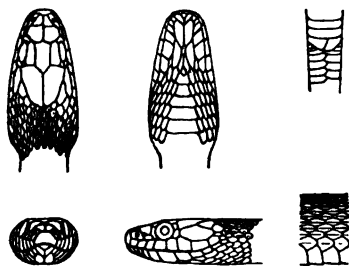


Fig. 263.

NATRIX USTA COPE.

= 1.

Charlotte Harbor, Florida.

Cat. No. 5296, U.S.N.M.

inferior labials, sixth largest. Posterior pair of genicals longer than the anterior. Tail one-fourth the total length. Gastrosteges, one hundred and twenty-six; anal one divided; urosteges, sixty-six.

¹ From Baird and Girard's Cat. N. Amer. Rept., Pt. 1, Serp., p. 97.

Measurements.—Total length, 302 mm.; tail, 50 mm.

Color above a yellowish ferruginous, pale upon the head, very deep upon the tail. Upon careful examination there are to be seen very indistinct erect half-bands upon each side, extending from the first to the central rows of scales, alternating with other. Posteriorly they become entirely transverse. Belly salmon color, passing into orange ferruginous upon the urosteges. Each gastrostegs has a large central area of yellow, bordered on each side with wax yellow; these colors, however, blend posteriorly, and are scarcely visible. In a specimen from Key West they are not distinguishable. In this specimen there are three postoculars on one side and the fifth labial scarcely enters the orbit.

Cat. Nos.	Gastrosteges.	Urosteges.	Length.	Tail.
			mm.	mm.
5286	126 + 1.	68.	302.	71.
13806	128 + 1.	82.	245.	66.

Natrix usta Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
5286	1	Charlotte Harbor, Florida ..	E. B. Baker	Alcoholic type.
13806	1	Key West, Florida	Prof. D. S. Jordan	do.

NATRIX GRAHAMII Baird and Girard.

Natrix grahamii COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 668.

Regina grahamii BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 47.

Tropidonotus grahamii GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 78.—COPE,

Check-list N. Amer. Batr. Rept., 1875, p. 42.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 240.

Brown, with a broad band of yellow on the flanks, margined below with a black vitta. Abdomen unicolor, yellowish. Dorsal rows of scales nineteen, all carinated.

Head elongated, slender, depressed, and flattened above, slightly sloping on the snout. Rostral higher than in *N. leberis*, internasals longer than wide. Elongated and posteriorly pointed, measuring from their anterior lower to the line of the nares. Front plate subpentagonal, narrower anteriorly. Superciliaries proportionally well developed, as also the anterior pair of frontals. Two anteorbitals, lower one a little the larger. Two postorbitals, rarely a very small and almost sub-orbital third. Loreal elevated. Upper labials seven, fifth and sixth largest. Lower labials ten, fifth and sixth largest. Dorsal rows of scales twenty, all carinated. The three outer rows sensibly the largest, and truncated posteriorly, while the remaining ones are tapering.

In the adult the dorsal region is uniformly brown. The first, second, and most of the third outer rows of scales are straw color. This yel-

lowish band extends forward, passing under the head to the extremity of the snout. A black line is seen running from behind the neck to the anus, affecting the extremity of the scutellæ, and occasionally the lower edge of the outer row of scales. The abdomen is uniform light straw color; a medial nebulous blackish band under the tail is observable. In other specimens there is a median row of small black spots on the belly, one on the basal part of each gastrosteges. Or there may be still more rarely two such rows forming two bands. This is the case with large specimens. In the young there is a median pale dorsal band one

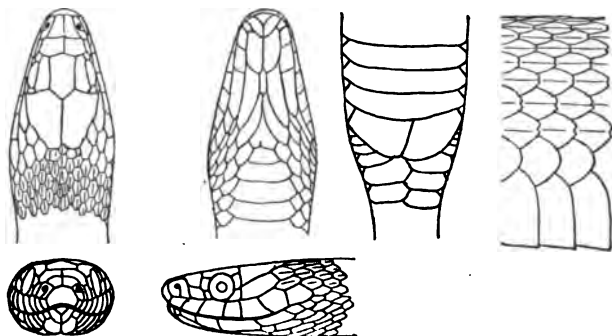


Fig. 264.

NATRIZ GRAHAMII BAIRD AND GIRARD.

= 1.

Northern Illinois.

Cat. No. 1400, U.S.N.M.

and two half scales wide, which has a narrow black border. There is also a black superior border to the lateral yellow stripe. From a specimen of this kind the species was originally described. These dorsal bands and stripes soon disappear, small specimens being often without them. The type specimen is also abnormal in having three postocular plates, being the only one presenting such a peculiarity in the large series in the U. S. National Museum.

Cat. Nos.	Gastrosteges.		Urosteges.	Length. mm.	Tail. mm.
12942.....	155	+ 1	51.	692.	110.
12956.....	163	+ 1	53.		
13040.....	136	+ 1	?		
1376.....	161	+ 1	57.		

Natriz grahamii Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1376	1	Rio Salado, Texas.....	.....	Col. J. D. Graham, U. S. A.	Alcoholic type.
749	1	Northern Illinois.....	.....	Lieutenant Couch, U.S.A.	do.
7214	1	New Orleans, Louisiana..	.....		do.
6385	1	Chicago, Illinois.....	.....	R. Kennicott.....	do.
1400	2	Northern Illinois.....	.....	do.....	do.

Natrix grahamii Baird and Girard—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
12942	1	New Orleans, Louisiana ..	—, 1883	R. W. Shufeldt	Alcoholic type.
12943	1	do	—, 1883	do	do.
12951	1	do	—, 1883	do	do.
12956	1	do	—, 1883	do	do.
12958	1	do	—, 1883	do	do.
12960	1	do	—, 1883	do	do.
12967	1	do	—, 1883	do	do.
13038	1	do	—, 1883	do	do.
13040	1	do	—, 1883	do	do.
12864	1	do	—, 1883	do	do.
16359	1	St. Louis, Missouri .....	.....	J. Hurter	do.
22455	.....	San Antonio, Texas .....	.....	H. H. and C. S. Brimley ..	do.
16239	.....	St. Louis, Missouri .....	.....	J. Hurter	do.
17964	.....	Milo, Bureau County, Illinois.	.....	O. P. Hay	do.

NATRIX LEBERIS Linnaeus.

Coluber leberis LINNÆUS, Syst. Nat., 12th ed., I, 1766, p. 216.—GMELIN, Linnaeus's Syst. Nat., 13th ed., I, Pt. 3, 1788, p. 1086.—SHAW, Gen. Zool., III, Pt. 2, 1802, p. 433.—DAUDIN, Hist. Nat. Rept., VI, 1803, p. 218.

Tropidonotus leberis HOLBROOK, N. Amer. Herp., IV, 1842, p. 49, pl. XIII.—DEKAY, New York Fauna Rept., 1842, p. 45, pl. xi, fig. 23.—DUMÉRIL and BIBRON, Erp. Gén., XII, 1854, p. 579.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 78.

Regina leberis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 45.

Coluber septemvittatus SAY, Journ. Acad. Nat. Sci. Phila., 1825, p. 240.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 355.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 239.

Chestnut brown, with a lateral yellow band, and three narrow, black dorsal vittæ. Abdomen yellowish, with four brown bands, two of which are lateral and two medial. Dorsal rows of scales 19, all carinated.

Head small, little distinct from body, depressed, flattened on the region behind the orbit, sloping anteriorly. Rostral plate low, nearly twice as wide as deep. Internasals wider than long. Frontal parietals elongate equal distance from their front angle to rostral. There are two anteorbitals, the upper one the larger; and two postorbitals, the upper one the smaller. The loreal is large and higher than long. One temporal shield only in the first row; two or three large ones in the second. Upper labials seven, third and fourth entering orbit, fifth and sixth largest. Lower labials ten, fifth and sixth largest. Scales regularly elliptical, slightly notched posteriorly, and all of them carinated, gradually diminishing in width from the sides toward the middle line of the back. Those of the outer row one-third broader than the rest, and posteriorly subtruncated.

Ground color dark chestnut or chocolate brown above, marked with three narrow, black vittæ or bands, one covering the medial row of dorsal scales, and two (one on each side) following the fifth row. A lateral yellow band occupies the upper half of the outer row and the

whole of the second row, thus broader than the black bands above. Immediately below, and contiguous to it, a somewhat larger brown band covers the lower half of the outer row of scales and the extremity of the abdominal scutellæ. The abdomen is yellowish, provided along its middle region with two approximate brown bands, similar, though a little narrower, and interrupted by the yellowish edge of the scutellæ. The tail beneath is almost rendered uniformly brown by the confluence of the bands.

This species inhabits a wide range of territory, and displays very little variation in any respect. It is entirely aquatic in its habits,

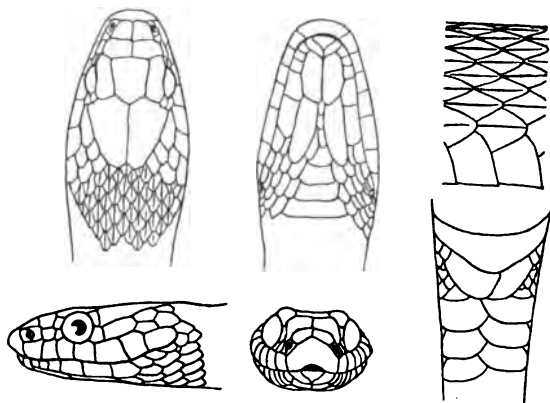


Fig. 265.

NATRIX LEBERIS LINNÆUS.

× 1.5.

Washington, District of Columbia.

Cat. No. 13287, U. S. N. M.

remaining on land only along the banks of creeks and rivers. It is entirely inoffensive in its manners.

Cat. Nos.	Gastrosteges.	Urosteges.	Length.	Tail.
13286.....	142 + 1.	72.	mm. 558.	mm. 136.
1403.....	151 + 1.	†		
4862.....	149 + 1.	76.		
1394.....	144 + 1.	81.		

Natrix leberis Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1394	1	Carlisle, Pennsylvania....	— —, 1847	Prof. S. F. Baird	Alcoholic type.
1492	1	Foxburg, Pennsylvania....		R. Kennicott	do.
1385	1	Root River, Wisconsin...	— —, 1853	Prof. S. F. Baird	do.
4862	1	Highland County, Ohio		Dr. George Suckley, U. S. A.	do.
4882	1	Georgia.....			do.
1388	1	Knoxville, Tennessee....		Prof. J. B. Mitchell.....	do.
1380	1	Anderson, South Carolina		Mrs. M. E. Daniel	do.
4740	1	Washington, District of Columbia.			do.

Natrix leberis Linnaeus—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1401	1	Owassa, Texas.....	— —, 1853	.....	Alcoholic type.
8948	1	Baltimore, Maryland.....	.....	Dr. E. Coues, U. S. A.....	do.
8950	1	Kinston, North Carolina.....	.....	J. W. Milner.....	do.
9106	1	Marietta, Georgia.....	.....	.....	do.
4829 $\frac{1}{2}$	1	Brookville, Indiana.....	.....	Dr. R. Haymond.....	do.
9332	2	.....	.....	.....	do.
10729	1	Livingston County, New York.....	Aug. —, 1880	S. C. Brown.....	do.
10322	1	Arlington, Virginia.....	July 1, 1879	William Palmer.....	do.
10081	1	do.....	Apr. 28, 1879	do.....	do.
10095	1	do.....	May 5, 1879	do.....	do.
1403	2	Foxburg, Pennsylvania.....	— —, 1848	Prof. S. F. Baird.....	do.
11464	1	Washington, District of Columbia.....	.....	George Shoemaker.....	do.
13287	.....	do.....	.....	do.....	do.
10052	1	Arlington, Virginia.....	.....	.....	Alcoholic.
16287	1	Waynesville, North Carolina.....	.....	P. L. Jouy.....	do.
17311	1	Washington, District of Columbia.....	.....	C. W. Richmond.....	do.
17330	1	do.....	.....	do.....	do.
17329	1	do.....	.....	do.....	do.
17457	1	do.....	.....	J. D. Figgins.....	do.
17479	.....	.....	.....	.....	.....
17480	.....	.....	.....	.....	.....
17481	.....	.....	.....	.....	.....
17482	6	Richmond, Indiana.....	.....	F. C. Test.....	do.
17483	.....	.....	.....	.....	.....
17484	.....	.....	.....	.....	.....
17970	1	Wabash, Indiana.....	.....	W. O. Wallace.....	do.
19064	1	Washington, District of Columbia.....	.....	W. F. Roberts.....	do.
14734	1	Montgomery County, Indiana.....	.....	C. S. Beachler.....	do.
21684	.....	Blanchard River, Finley, Ohio.....	.....	U. S. Fish Commission.....	do.
21685	.....	Sugar Creek, Lima, Ohio.....	.....	do.....	do.
21686	.....	Cedar Creek, Waterloo, Indiana.....	.....	do.....	do.
21687	.....	Fish Creek, Hamilton, Indiana.....	.....	do.....	do.
17311	.....	Washington, District of Columbia.....	.....	C. W. Richmond.....	do.
17327-30	.....	do.....	.....	do.....	do.
17389	.....	Palatka, Florida.....	.....	do.....	do.
17457	.....	Washington, District of Columbia.....	.....	J. D. Figgins.....	do.
17479-84	.....	Richmond, Indiana.....	.....	Frederick C. Test.....	do.
17970	.....	Wabash, Indiana.....	.....	W. O. Wallace.....	do.
18028	.....	District of Columbia.....	.....	Kenneth F. Beal.....	do.
19046-7	.....	Takoma Park, District of Columbia.....	.....	Dr. R. W. Shufeldt.....	do.
19064	.....	Washington, District of Columbia.....	.....	W. F. Roberts.....	do.

NATRIX KIRTLANDII Kennicott.

Natrix kirtlandii COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 391.

Regina kirtlandii KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1856, p. 95.

Tropidoclonium kirtlandii COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 340; Checklist N. Amer. Batr. Rept., 1875, p. 42.

Clonophis kirtlandii COPE, Proc. U. S. Nat. Mus., XI, 1889, p. 391.

Ichnognathus kirtlandii BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 286.

Teeth of equal length. Head not distinct from body. Scales keeled; anal scutum and subcaudal scuta divided. Cephalic plate normal; two internasals, rostral not prominent. One half-divided nasal, one loreal, and one preocular.

The body of this species is somewhat trigonal in cross-sections flattened on the abdomen, and tapers gently from the middle to either extremity. There is no distinction of neck, and the very small head

calls to mind that of the *Carpophiops amoenus* of Say. It is, however, much larger, and the scales are very strongly carinated. The carinae are found on all the longitudinal rows of scales, of which there are nineteen exclusive of the belly scales. The external row is almost as sharply keeled as those on the back, even to the tip of the tail. The dorsal scales are narrow and elongated; the sides nearly parallel except near the ends. As already stated, the head is very small, the vertical plate is subhexagonal, the two anterior sides forming a very obtuse angle; the external edges are very convergent posteriorly. The nostrils in the middle of the two plates. There are one anteorbital and two postorbitals; there are six labials above and seven below, in addition to the rostrals. The ground color of this snake is a light purplish brown, with four rows of large, nearly circular, blotches covering the whole back and sides. They are arranged so as to alternate; the outer

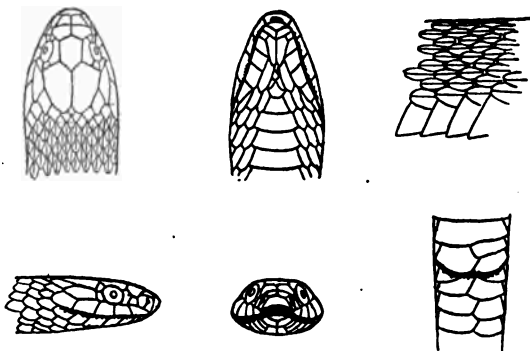


Fig. 206.

NATRIX KIRTLANDII KENNICOTT.

× 1.5.

West Northfield, Illinois.

Cat. No. 1514, U.S.N.M.

blotches on the outer row are a little larger than those on the two central ones, and are of the width of four or five scales. The belly is of a pale brick red, fading to brownish yellow in alcohol, with a well-defined blotch of black near the exterior of each scale. These give rise to a series of very well-defined round black spots on either side of the abdomen, and there is also an obscure series of dark blotches on the

anterior edge of the scales in the exterior dorsal row. The dots in this series are separated by intervals of two unmarked scales. The spots of this row alternate with those of the larger series immediately above.

On separating the scales the skin is seen to be colored like the adjacent scales. It is black in the dark blotches and very light in the intermediate space, giving rise to the appearance of a whitish edge to the scales. There are thus four series of large spots on the back and sides, two on the belly, and two on the exterior dorsal rows, making eight in all. The last-mentioned row is sometimes very obscure, the others are always distinct. Kennicott referred this serpent to the genus *Tropidonotus* (*Natrix*), although it is different from the known species. It is somewhat like the *N. rigida*, but is differently marked. the latter having the two abdominal rows of spots close together on the middle of the belly instead of being separated. Neither is there any indication in *N. rigida* of the four series of dorsal blotches. In fact there is no North American species more strongly marked than this.

Abdominal scuta, 123, the last one divided; subcaudal, 59. Dorsal rows of scales, 19.

Measurements.—Length, 488 mm., of which the tail measures 112 mm. As yet this species has only been detected in the northern central part of the eastern region, where it is not uncommon. The specimens obtained have been found in the woods, generally under logs. Its habits are thus not like those of a *Natrix*. It is rather sluggish and not very pugnacious.

In its distribution this species is one of the group which is restricted to a few of the northern States of the Mississippi Valley. These are Wisconsin, Michigan, Illinois, Indiana, and Ohio.

Natrix kirtlandii Kennicott.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1514	2	West Northfield, Illinois.	.....	R. Kennicott	Alcoholic.
12627	2	Kalamazoo, Michigan	Nov. —, 1879	G. B. Sudworth	do.
17957	1	Irrington, Indiana .....	.....	O. P. Hay	do.
17953	.....	Winchester, Randolph County, Indiana.	.....	.....do.....	do.

Professor Hay remarks:¹

This species is common about Indianapolis, almost as common as *Eutamias striatus*. It is found in Monroe County (D. S. Jordan); Crawfordsville (Beachler); Winchester (Engle and Wright); rare about Terre Haute, common in Putnam County (Blatchley).

This is a handsome species of snake, and one that is wholly innocent; nevertheless it exercises the right of the innocent, and when attacked makes a show of self-defense. It has a habit of flattening itself excessively, so that it becomes very broad and thin. It will strike vigorously, but does no harm. It appears early in the spring, and is seen late in the autumn. In a mild winter and on a sunny day, I have seen it on January 25. On the other hand, I have seen it as late as the middle of October; indeed, it appears to be more abundant late in the autumn than in the summer. About this date, several half-grown ones were found. On the 21st of March one was dug up out of the mud on the margin of a pond. A specimen from Winchester, Indiana, contained eight eggs. These had apparently not begun development, and were only about 0.44 inch long. The species probably produces living young.

NATRIX STORERIOIDES Cope.

Natrix storerioides COPE, Proc. U. S. Nat. Mus., XI, 1889, p. 391.

Tropidoclonium storerioides COPE, Proc. Acad. Nat. Sci. Phila., 1865, p. 190.

Storeria storerioides GARMAN, N. Amer. Rept., 1883, p. 29.

Ischnognathus storerioides BOULENGER, Cat. Snakes Brit. Mus., 2d ed., I, 1893, p. 238.

Size small, form not slender, muzzle obtuse; in general, similar to *Storeria dekayi*. Scales fifteen rows, the inferior row only smooth, much broader than the others, which are narrowest medially. Scales of tail strongly keeled, in six rows. Nasals not elongate, usually entirely, sometimes half separated. Loreal trapezoidal, touching the decurved postfrontals by the superior angle only, its hinder suture shortest, sometimes entering the orbit posteriorly between the two pre-

¹ Batrachians and Reptiles of Indiana, Indianapolis, 1893, p. 97.

oculars; of the latter, the inferior is the smaller. Postoculars three; in contact with one broad temporal, which separates two labials from the occipital. Superior labials seven, or six from confluence of two, sometimes of the third and fourth, which bound the orbit. Inferior labials seven, fourth largest; postgenaeal equal pregenaeal, separated by scales. Frontal shield longer than broad, outlines straight, posterior angle less than right; occipitals nearly as long as from their border to rostrals, emarginate behind. Gastrosteges 120-135; anal 1-1; urosteges 37-51. Color olive-brown (one specimen light brown), with dense, minute punctuations above and below, and about fifty-four light-edged black crossbars extending over six rows of scales, alternating with shorter ones on the sides; both are broken into spots on the neck, where there is a large postoccipital blotch on each side.

Measurements.—Total length, 230 mm.; length of tail, 66 mm.; length to rictus oris, 10 mm.

This species has a strong resemblance to the species of *Storeria*, and is placed in that genus by Boulenger, on account of the equality in the length of the teeth. It is found in the southern part of the plateau, and, according to Boulenger, in the highlands of Jalisco.

Natrix storerioides Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
9055-60	6	Southern plateau.....	Dr. C. Sartorius.....	Alcoholic.

SEMINATRIX Cope.

Seminatrix COPE, American Naturalist, 1895, p. 678.

Hemipenis undivided and with simple sulcus spermaticus; no papillæ. Internasals and prefrontals separate. Anal divided. Scales smooth, without pits.

This genus includes true Natricinæ with simple penis, divided anal plate, and smooth pitless scales. In one or the other of these characters it differs from all the genera of Natricinæ. It will be necessary to discover whether some of the smooth-scaled snakes of other countries referred by Boulenger to *Tropidonotus*, do not belong to *Seminatrix*.

But one species is known from the Medicolumbian fauna, which is thus characterized:

Scales in seventeen series; superior labials, eight; body compressed posteriorly; black above, red below; small *S. pygæa* Cope.

SEMINATRIX PYGÆA Cope.

Seminatrix pygæa COPE, American Naturalist, 1895, p. 678.

Contia pygæa COPE, Proc. Acad. Nat. Sci. Phila., 1871, p. 222.

Tropidonotus pygæus BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 228.

The form of this species is stout and subcylindric, the tail entering the total length 4.33 times. The head is stout, oval, the profile a little

arched. The center of the orbit anterior to the middle of the lip margin. The rostral is visible from above; the nasals approach so as to reduce the internasals to a subtriangular form each, of which the middle and posterior sutures are equal. The frontal is long and with parallel sides, its length exceeding that of the head in front of it. The parietals are still longer and wide, with subtruncate outline behind. Loreal plate higher than long, half the length of the single preocular, which does not reach the frontal. Postoculars two; temporals 1-2, the first in contact with three labials. Superior labials eight, their height subequal, the fourth and fifth bounding the orbit. Inferior labials nine, six in contact with genieals, five with the first, two with the second genieal; latter subequal. Scales in seventeen series, those of first deeper than long. Those of sides at vent and of basal two-thirds of the tail roof-shaped or obtusely keeled. About one-sixth of the length in front of and behind the vent compressed, the dorsal outline keel-formed. Gastrosteges, 120; urosteges, 54.

Coloration above black, with a very faint, pale line along the center of each scale of several lateral series. The lines are more distinct near the vent and on the tail, and heighten the effect of carinae produced by the angulation of the scales. Beneath pale in the alcoholic specimen; in life, belly with the tail red; each scutum with a short black crossbar at its ends on the anterior margin. These cease a short distance anterior to the vent.

This species was discovered by Edward Tatnall, of Wilmington, Delaware, at Volusia, Florida. Since then others have been found at various points in the peninsula, among others at Lake Tarr, whence specimens have been sent to the Philadelphia Zoological Garden.

Without examining the vertebrae I originally referred this species to *Contia*, as its smooth scales did not suggest reference to the water snakes. Subsequently Dr. Boulenger, in the Catalogue of Snakes in the British Museum, placed it in *Tropidonotus*. To determine the question by the penial test I later examined the male organ and found that Dr. Boulenger's estimate of its affinities was entirely correct. I, however, think its peculiarities entitle it to generic separation from *Natrix*.

Concerning this species Dr. Einar Lønnerberg¹ says:

I have but rarely found this little snake out of water, and in such cases only under some log or board near the water's edge. It is common around the borders of the small lakes in Orange County, where I have seen and caught specimens in Lake Eola, Orlando, in and around some small lakes near Clarcona, Toronto, Apopka, and other places.

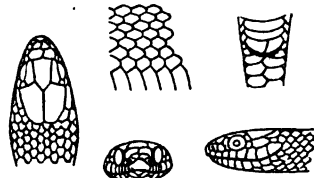


Fig. 267.

SEMINATRIX PYGÆA COPE.

× 1.5.

Florida.

¹Notes on Reptiles and Batrachians collected in Florida in 1892 and 1893. Proc. U. S. Nat. Mus., XVII, 1894, p. 317.

The number of supralabials is variable. In most cases there are eight, but I have two specimens with only seven, and one with only six on one side. In these cases of reduction the posterior ones have become fused, as is shown by their size and the frequent presence of an incomplete section.

STORERIA Baird and Girard.

Storeria BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 135.

Ischnognathus DUMÉRIL, Prodrôme des Ophidiens, 1853, p. 72.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 506.

Head distinct from the body. Cephalic plates normal. Loreal plate absent. Orbitals posterior and anterior. Nasals two. Body subcylindrical; tail comparatively short, tapering. Dorsal scales carinated. Anal scutum bifid. Subcaudals divided. Teeth small, numerous, of equal lengths, ungrooved.

This genus is a reduced type of *Natrix*, to which it is connected by the Mexican *N. storerioides* Cope. Its range is nearctic, extending south as far as the plateau of Vera Paz and Guatemala.

There are three species of the genus, which differ as follows:

- Oculars 1-2; seven upper labials, the posterior wide; nostril between nasals; belly grayish white; a black spot below orbit *S. dekayi*.
 Oculars 1-2; six upper labials, the posterior narrow; nostril between nasals; no black spot below orbit; belly grayish white *S. tropica*.¹
 Oculars 2-2; five or six upper labials, the posterior narrow; nostril in anterior nasal; no dark spot below orbit; belly red *S. occipitomaculata*.

S. tropica agrees with the *S. dekayi* Holbrook, excepting in two points. It has but six superior labials. The diminution in the number is posterior to the orbit, and the fifth and sixth scuta are of a different form from those of the *S. dekayi*. They are longer and less elevated. The second character is in the color. This species lacks the dark mark that descends from the orbit to the superior labial margin in the *S. dekayi*.

STORERIA DEKAYI Holbrook.

Storeria dekayi BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 135.—COPE, Check-list N. Amer. Batr.-Rept., 1875, p. 42.

Tropidonotus dekayi HOLBROOK, N. Amer. Herp., III, 1842, p. 53, pl. xiv.—DEKAY, New York Fauna Rept., 1842, p. 46.

Ischnognathus dekayi DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 507.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 286.

Tropidonotus ordinatus STOREY, Rept. Mass., 1839, p. 223.

One anterior and two posterior orbitals. Dorsal rows seventeen. Gray or chestnut-brown above, with a clay-colored dorsal band, margined by dotted lines. A dark patch on each side of the occipital; a dark bar between this and the eye, and two below the orbit.

Body rather thick in the middle, tapering to the tail and head, both of which are small and slender. Eyes small. Rostral plate about as

¹*Storeria tropica* Cope, Proc. Amer. Phil. Soc., 1884, p. 175.

wide as high, obtusely rounded, visible from above. Internasals wider than long. Frontal with lateral and anterior borders straight and about equal, twice as wide as each superciliary. Parietals longer than wide, truncate posteriorly. Nostril partially in the prenasal. Temporals 1-2, the first extending to middle of last superior labial. Seven upper labials on each side. Lower labials seven, of which the fourth and fifth are very large, extending quite to the mental. A second plate parallel with the sixth, rather longer. Pregeneials longer than postgeneials; the latter bounded behind by the generally undivided first gastrostege, which is separated from the labials by one row of scales. Exterior row of scales largest, rest diminishing gradually to the back; all keeled, the first weakly.

Color grayish brown, sometimes chestnut-brown above and on the sides, with a dorsal stripe extending from occiput to the end of the tail, of a decidedly lighter tint, and about three and two half-scales in width. This is bordered along each outer edge by a series of rounded brown dots, occurring at intervals of about two scales; of these there are

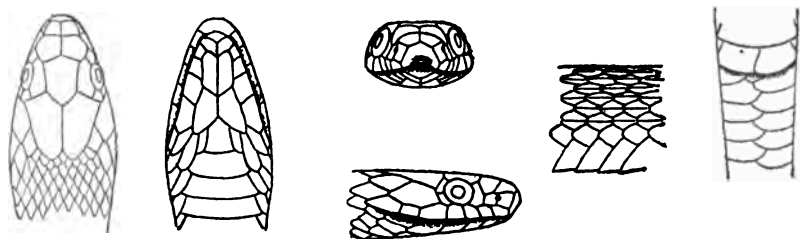


Fig. 268.

STORERIA DEKAYI HOLBROOK.

× 2.

Racine, Wisconsin.

Cat. No. 1868, U.S.N.M.

about seventy pairs from occiput to anus. Each dot occupies generally a single scale, but is sometimes seen on the skin on each side. On separating the scales, the skin on each side of the fourth lateral row of scales exhibits a second series, similar to and alternating with the first. A third series, opposite to the first and alternating with the second, is seen along the second row, and there are even traces of a fourth between the abdominal and first dorsal series. Of these only the first-mentioned series is visible under ordinary circumstances, and is generally only to be made out on separating the scales, the color only occasionally being shown on their margins. The first pair of dots just behind and across the angle of the jaw is enlarged into a crescentic patch, concave before. A second narrow vertical patch of black across the sides of the head, anterior to a point halfway between the first and the eye; this sometimes interrupted in the middle. The posterior margins of the third and fourth (sometimes the second) labials black, showing two vertical lines below the orbit. Plates on top of head mottled chestnut-brown.

Color beneath grayish white, with one or two black specks near the exterior edge of each scale. Tail unicolor.

Cat. Nos.	Gastrostege.	Urostege.
4918.....	134 + 1.	65.
2222.....	145 + 1.	46.
4653.....	126 + 1.	46.
7279.....	132 + 1.	46.

In some specimens the brown of the sides increases in depth to the dorsal stripe. In some, too, a transverse bar connects the lateral spots across the back.

In a very young specimen from Grosse Ile, the colors are dark chestnut above, with the interval between the occipital patches and the cephalic plates and orbit white, crossed by a vertical black line on the angle of the mouth.

Measurements.—Length, $4\frac{1}{2}$ inches.

Anomalies in the scutellation of this species sometimes occur. The most frequent is the longitudinal division of the first abdominal scutum, which then forms a third pair of geneial plates. This character has been made the basis of the variety "*anomala*" of Duges.¹ It occurs in Cat. Nos. 1860, 2215, 4918, 6474, U. S. National Museum. In Cat. No. 2275 there are two preoculars on each side. In Cat. No. 1860 there is a small superior postnasal on one side.

This species is distributed throughout the entire eastern and auroriparian regions of North America as far west as Kansas. Southward it extends into Mexico on the table-land, and to the State of Vera Cruz. The largest specimens come from about New Orleans.

Like its allies of the *Natricinae*, the *Storeria dekayi* is viviparous. It is abundant and is gentle in disposition, making no attempt to bite. It is entirely terrestrial in its habits, and I have never known it to be found near water.

Storeria dekayi Holbrook.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1858	2	Racine, Wisconsin.....	.....	Dr. P. R. Hoy.....	Alcoholic type.
7278	3	St. Louis, Missouri.....	.....	Dr. Geo. Engelmann.....	Alcoholic.
6388	2	Chicago, Illinois.....	.....	.....	do.
2216	4	Aux Plaine, Illinois.....	.....	R. Kennicott.....	do.
4918	2	Eastport, Maine.....	.....	.....	do.
1857	1	Columbus, Ohio.....	.....	Prof. L. Leaqueux.....	do.
1947	1	Highland County, Ohio.....	.....	.....	do.
6474	1	Madison, Ohio.....	.....	.....	do.
2230	1	Mississippi.....	.....	.....	do.
2226	2	Monticello, Mississippi.....	.....	Miss H. Tunison.....	do.
2215	1	Savina, Canada.....	.....	Prof. S. F. Baird.....	do.
4966	2	St. Catherine's, Canada.....	.....	Dr. D. W. Beadle.....	do.
1949	1	Washington, District of Columbia.....	.....	Prof. S. F. Baird.....	do.
2222	1	Pensacola, Florida.....	.....	Dr. W. A. Hammond, U. S. A.....	do.
4653	1	Kansas.....	.....	.....	do.
2210	1	Tyree Springs, Tennessee.....	.....	Dr. Owen.....	do.
1945	2	Pittsburg, Pennsylvania.....	.....	G. W. Fahnestock.....	do.
5565	1	Jalapa, Mexico.....	.....	.....	do.
2085	1	Brazos River, Texas.....	.....	Dr. B. F. Shumard.....	do.
7279	1	Matamoras, Mexico.....	.....	Lieutenant Couch, U.S.A.....	do.

¹Proc. U. S. Nat. Mus., XI, 1888, p. 9, figures.

Storeria dekayi Holbrook—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
427	1	New York.....	.....	.....	Alcoholic.
2136	1	Lebanon, Indiana.....	.....	S. B. Davis.....	do.
1944	1	Mount Auburn, Massachusetts.....	.....	Dr. C. Girard.....	do.
5199	1	Grand Couteau, Louisiana.....	.....	.....	do.
4814	1	Southern Illinois.....	.....	R. Kennicott.....	do.
1860	2	Framingham, Massachusetts.....	.....	Capt. S. Van Vleet, U. S. A.....	do.
8983	3	Kinston, North Carolina.....	.....	J. W. Milner.....	do.
8939	1	Orizaba, Mexico.....	.....	Prof. F. Sumichrast.....	do.
8951	2	Ferry Landing, Virginia.....	May 29, 1875	H. W. Welsher.....	do.
4900	1	Washington, District of Columbia.....	.....	Dr. W. Stimpson.....	do.
10654	1	Wheatland, Indiana.....	Apr. —, 1881	Robert Ridgway.....	do.
10211	2	St. James Parish, Louisiana.....	May —, 1879	O. de la Pelchardière.....	do.
12028	8	Mount Carmel, Illinois.....	Nov. —, 1881	L. M. Turner.....	do.
2275	1	Port Huron, Michigan.....	.....	S. F. Baird.....	do.
11823	1	Old Fort Cobb.....	.....	E. Palmer.....	do.
15377	.....	New Orleans, Louisiana.....	.....	Dr. R. W. Shufeldt.....	do.
15577	.....	Cherokee, North Carolina.....	.....	James Mooney.....	do.
17058-9	.....	Cameron County, Texas.....	.....	C. K. Worthen.....	do.
17282-7	.....	Washington, District of Columbia.....	.....	C. W. Richmond.....	do.
17447-54	.....	do.....	.....	J. D. Figgins.....	do.
17583-4	.....	do.....	.....	R. W. Brown.....	do.
17699	.....	New Braunfels, Texas.....	.....	U. S. Fish Commission.....	do.
17966	.....	Cumberland Gap, Tennessee.....	.....	O. P. Hay.....	do.
17967	.....	Irvington, Indiana.....	.....	do.....	do.
21683	.....	Grand Rapids, Ohio.....	.....	U. S. Fish Commission.....	do.

This species is not readily exterminated by the increase of population; its fecundity, obscure colors, and small size protecting it. A vacant lot on the outskirts of Philadelphia has been noted as a place for finding them, and the boys that know can generally procure specimens there when they are desired.

STORERIA OCCIPITOMACULATA Storer.

Storeria occipitomaculata BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1833, p. 137.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 42.

Tropidonotus occipitomaculatus STORER, Rep. Rept. Mass., 1839, p. 230.

Iscnognathus occipitomaculatus GÜNTHER, Cat. Colubr. Snakes Brit. Mus., 1858, p. 61.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 287.

Coluber venustus HALLOWELL, Proc. Acad. Nat. Sci. Phila., III, 1847, p. 274; VI, 1849, p. 245.

Orbitals, two anterior, two posterior. Dorsal scales in 15 rows. Above gray, or chestnut-brown, sometimes with a paler vertebral line; beneath red or salmon-color. Three distinct light-colored spots behind the head and a smaller one on the fourth and fifth upper labial.

Nostril almost entirely in the prenasal plate, in some cases the postnasal not entering at all into it. Six upper labials, eye over third and fourth, all higher than long except the fifth and sixth. The fifth is about twice as long as high, and the sixth is rather shorter. Temporals 1-2, the first pointed posteriorly and extending over more than half of the sixth superior labial. Lower labials 7, fourth and fifth of equal length, but fifth wider. Pregeneals longer than postgeneals, the latter bounded by first gastrostege, which is never divided. Vertical plate

hexagonal, shield-shaped. Muzzle rather broad, eyes larger than in *S. dekayi*.

Color above light chestnut-brown, sometimes chestnut-gray, at others olivaceous; a paler vertebral line from occiput to end of tail, about three scales in width; on each side of this may be seen a series of minute brown spots, produced by the brown bases of the scales in the third row on each side from the central series. Sometimes the brown covers the whole scale, and gives rise to two dorsal lines; at others it is almost entirely wanting, and this, connected as it generally is with a less distinct vertebral band, gives the impression of a uniform tint above. Upper margin of the exterior dorsal lines brighter yellowish, giving the effect in some cases of a lateral narrow light line. Abdomen in life salmon-color, in alcohol whitish yellow, with the sides finely mottled with dark-brown, sometimes obsoletely, at others constituting very distinct bands. These generally do not encroach upon the dorsal scales. Occasionally, however, the middle of the exterior row of scales exhibits a dark stripe. Immediately behind the occipital plates, and on the median line, is seen a dull salmon-colored blotch, on each side

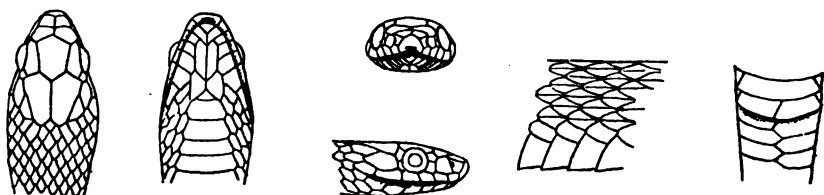


Fig. 269.
STORENIA OCCIPITOMACULATA STORER.
X 2.

Upper Wisconsin River.
Cat. No. 1280, U.S.N.M.

of which, over the angle of the jaws, is a similar smaller one. The intervals between these blotches sometimes darker. A small salmon-colored spot on the fourth or fifth upper labial, behind the orbit. Plates on the top of the head blotched with darker. Lower jaw minutely dotted with brown.

The following description of a living specimen caught at Westport, New York, August, 1847, is from Prof. S. F. Baird's manuscripts:

Iris dark chestnut, rather lighter above and externally. General color above dull chestnut-brown. Attentively examined, however, when wet, there is seen a faint dorsal stripe of lighter color, bordered by a line on each side of darker, which fades off to the abdominal scutellæ until the color is the same as the dorsal line, or even lighter. Behind the head are three light yellowish brown occipital spots. Whole under parts, except the chin or throat, bright brick-red. Chin and throat white, mottled finely with gray and black, like pepper and salt. An irregularly defined stripe of the same mottling along the sides, from head to anus, crossing the abdominal scutellæ near the outside.

A strongly marked variety is seen in individuals from Charleston and Anderson, South Carolina, in which the body is dark slate-blue, except the middle third of the abdomen, which is yellowish white. The dorsal of black dots are visible through the ground-color; the lateral

lighter line is scarcely perceptible. The three occipital spots, and that on the labials, are distinct.

Another variety is seen in a specimen from Pittsburg, Pennsylvania, where, in addition to the coloration just mentioned, the vertebral stripe is light chestnut, contrasting strongly with the ground-color.

Another specimen which I found at Johnsonburg, Elk County, Pennsylvania, in a rugged region, is a very dark brown with the dorsal band obscure and the under surfaces black. The throat and chin are whitish, and the black is darkest in a row of spots on each side of a dozen anterior gastral plates.

Cat. Nos.	Gastrosteges.	Urosteges.
1935	118 + 1.	39.
10715	132 + 1.	46.
2133	130 1.	44.
1938	118 + 1.	45.

This small snake is generally distributed in the Eastern and Austro-riparian regions, having about the same range as the *S. dekayi*. It extends south also to Vera Cruz, Mexico. It is less common in the United States than the *S. dekayi*, but I have found it more abundant in western Massachusetts. Like its congener, it is entirely inoffensive, and is found on the ground and in the woods in dry places.

Storeria occipitomaculata Storer.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1943	2	Westport, New York	— —, 1847	Prof. S. F. Baird	Alcoholic.
1939	1	Madrid, New York	.....	E. A. Dayton	do.
7284	2	Southern Illinois	.....	R. Kennicott	do.
5309	1	Moose River, Montana	.....	C. Drexler	do.
6473	1	Madison, Ohio	.....	.....	do.
2151	1	Yellow Creek, Ohio	— —, 1853	Prof. S. F. Baird	do.
2133	3	Red River, Texas	.....	R. Kennicott	do.
4651	1	Kansas	July 16, 1859	Capt. J. H. Simpson, U. S. A.	do.
2144	2	Anderson, South Carolina	.....	Mrs. M. E. Daniel	do.
6473	1	Somerville, North Carolina	.....	.....	do.
7280	1	Upper Wisconsin River	.....	R. Kennicott	do.
7281	1	Racine, Wisconsin	.....	Dr. P. E. Hoy	do.
1938	1	Pittsburg, Pennsylvania	.....	.....	do.
2147	1	Society Hill, North Carolina	.....	M. A. Curtis	do.
2138	1	Gloucester, Virginia	.....	.....	do.
1937	1	Centerville, Maryland	.....	.....	do.
1912	1	Georgia	.....	S. Mann	do.
1935	1	Portland, Maine	.....	Professor Caldwell	do.
1964	1	Near Mammoth Cave, Kentucky	.....	Dr. B. F. Shumard	do.
2146	2	Somerville, North Carolina	.....	.....	do.
8793	1	Augusta, Georgia	.....	William Phillips	do.
8775	1	Belleville, Illinois	Sept. —, 1874	Dr. A. Reuss	do.
9948	1	Northern Illinois	.....	R. Kennicott	do.
10715	1	Baraboo, Wisconsin	Oct. —, 1880	J. Wood	do.
10089	1	Hughes, Ohio	Apr. —, 1879	R. T. Shepherd	do.
12022	3	Mount Carmel, Illinois	Nov. —, 1881	L. M. Turner	do.
17562	1	Montgomery County, Maryland	.....	P. Leonhart	do.
17640	1	Hill City, South Dakota	.....	Titus Ulke	do.
17834	1	Westbrook, Maine	.....	A. H. Parker	do.
16264	.....	Cranberry, North Carolina	.....	P. L. Jouy	do.
16690	.....	Keene Valley, Essex County, New York	Aug. 9, 1890	C. F. Batchelder	do.
17424	.....	Castine, Maine	.....	C. W. Richmond	do.
19972	.....	Norfolk, Connecticut	.....	A. F. Wooster	do.
21133	.....	Matlock Springs, Creek, Tennessee	.....	U. S. Fish Commission	do.
22223	.....	Haven, Hancock County, Maine	.....	F. W. True	do.

VIRGINIA Baird and Girard.

Virginia BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 127.—COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 53; Proc. U. S. Nat. Mus., XIV, 1892, p. 599.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 288.

Head subelliptical, distinct from the body. Cephalic plates normal. Two nasals; posterior one not invaded by the nostril. Postfrontals and loreal entering into the orbit, and suppressing the anteorbitals. Superciliaries well developed. Mental scutellæ two pairs. Pupil circular. Scales smooth. Postabdominal scutella bifid. Subcaudal scuta all divided.

The distinctness of the head from the neck, and the relatively narrow frontal plate in this genus, resemble conditions common in the Hatricinæ. The lateral head scuta are like those of *Rhabdosoma* and its immediate allies.

But two species are known:

Scales wide, in 15 rows..... *V. valeria*
Scales narrow, in 17 rows..... *V. elegans*

These species occur in both the Eastern and Austroriparian districts, the *V. elegans* in the western part of the latter only. The former has not yet been found north of the Carolinian division of the eastern district.

VIRGINIA VALERIÆ Baird and Girard.

Virginia valeriæ BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 127.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 35.—JAN, Icon. Gén. Ophid., Pt. 12, pl. II, fig. 5.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 389.

Carphophis harperti DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 135.

Two triangular internasals. Prefrontals large, entering the orbit.

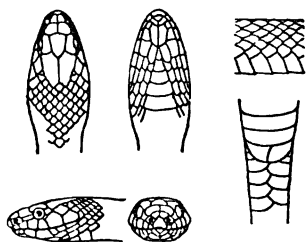


Fig. 270.

VIRGINIA VALERIÆ BAIRD and GIRARD.
× 1.53.

Washington, District of Columbia.
Cat. No. 18300, U.S.N.M.

Frontal pentagonal, longer than wide; parietals still longer, ovate. Nasals bifid. Loreal forming a long subrectangular plate, which enters the orbit. Postorbitals two, or more rarely, three. The superior largest. Temporals 1-2, anterior large, not or but little in contact with orbitals. Labials six, third and fourth in orbit, fifth largest, sometimes in contact with the parietal by its upper angle. Infralabials six. Two pairs of elongate submentals, posterior divergent. Scales smooth, in fifteen rows. Gastrosteges, 111. Anal bifid. Urosteges, 32. Body rather stout; tail short.

Ground color uniform yellowish or grayish brown; dull yellow beneath. Minute black dots are in most cases scattered along the upper part of the body, forming sometimes two longitudinal series, one on each side of the median line. Along the middle of each scale is a

faint light line, which makes the body appear as if striated. On the outer rows this light line is broader, and it appears as a succession of oblong spots.

Cat. Nos.	Upper labials.	Gastrosteges.	Urosteges.	Scales.	Length. mm.	Tail. mm.
1962.....	6.	127 + 1.	25.	15.	215.	28.
1876.....	6.	125 + 1.	27.	15.	210.	28.

Virginia valeria Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
7303	1	Cook County, Illinois	R. Kennicott.....	Alcoholic.
4432	1	Southern Illinois	do.....	do.
2224	1	Tyree Springs, Tennessee ..	Prof. R. Owen.....	do.
1876	1	Anderson, South Carolina ..	Miss C. Paine.....	do.
1962	1	Kent County, Maryland	Miss V. Blaney.....	do.
13300	1	Washington, District of Columbia.	George Shoemaker.....	do.
10742	1	Statesville, North Carolina ..	A. L. Barringer.....	do.
17289	1	Washington, District of Columbia.	C. W. Richmond.....	do.
17288	1	Great Falls, Maryland	do.....	do.
17446	1	Dunn Loring, Virginia	G. W. Figgins.....	do.
17639	1	Linden, Maryland	N. P. Scudder.....	do.

VIRGINIA ELEGANS Kennicott.

Virginia elegans KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1859, p. 99.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 35.—JAN, Icon. Gén. Ophid., Pt. 12, pl. II, fig. 6.—BOULENGER, Cat. Snakes Brit. Mus., II, 1894, p. 289.

Frontal plate hexagonal, elongated, anterior angle open; parietals oblong, exteriorly rounded. Postfrontals irregularly angular, produced into the orbit. Prefrontals subtriangular, proportionally small. Rostral narrow, and tapering upward. Nostrils in the middle of the posterior margin of the prenasal. Loreal elongated, forming together with the postfrontals, the anterior portion of the orbit. Eyes small. Supraorbitals rather large, oblong, elongated. Postorbitals two; angular, lower one between the fourth and fifth labials. Mouth deeply cleft. Upper labials six, fifth largest; inferior labials six, fourth largest. Temporal shields 1-2, well developed. Body slender, subcylindrical, flattened beneath; tail very short, diminishing very rapidly toward its acute tip. Dorsal scales narrow and elongated, more so than in *V. valeria*; disposed in seventeen rows.

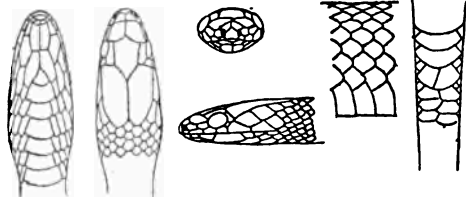


Fig. 271.

VIRGINIA ELEGANS KENNICOTT.

× 2.

Dallas, Texas.

Collection of E. D. Cope.

Color uniform light olivaceous brown above to pinkish and orange; dull yellowish-white beneath. There is generally an indistinct pale dorsal band covering a width of one and two half rows of scales, and bounded

on each side by a row of black specks, situated at intervals of one or two scales, differing in different specimens. On the fourth row of scales on each side is another row of specks which are separated by spaces of two scales length. The top of the head posterior to the prefrontals is more or less speckled with dark brown. Labial scuta immaculate.

Cat. Nos.	Upper labials.	Gastroteges.	Urostegea.	Scales.	Length. mm.	Tail. mm.
2055.....	6.	125.	25.	17.	222.	29.
12023.....	6.	120.	25.	17.	196.	29.

The specimens show considerable variation in the number of the postocular scuta. Thus in two specimens from Fort Towson, Arkansas (Cat. No. 2055), there are three on each side; in Cat. No. 12023, from Mount Carmel, Illinois, there are two on each side, and in Cat. No. 13632, from Helotes, Texas, the two are fused into a large one on each side.

The differences between this species and the *V. valeriae* are restricted to the form and number of the scales. Beyond these I have not been able to detect any.

Virginia elegans Kennicott.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2055	1	Fort Towson, Red River, Arkansas.	.....	Dr. L. A. Edwards, U. S. A.	Alcoholic.
2056	1	do	.....	do	do.
12023	1	Mount Carmel, Illinois	Nov. —, 1881	Lucien M. Turner	do.
13632	1	Helotes, Texas	.....	G. W. Marnock	do.
	1	New Orleans	.....	From the throat of an <i>Ophibolus sayi</i> , Cat. No. 4288.	do.
15335	1	Texas	.....	J. H. Clark	do.
22816	1	Liberty Hill, Texas	.....	H. H. Thorpe	do.
20814	.....	St. Louis, Missouri	.....	Julius Hunter	do.
22328	.....	Kerrville, Texas	.....	Hy. Caudlin	do.

I have this species in my private collection, from Dallas, Texas.

AMPHIARDIS Cope.

Amphiardis COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 391.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 290.

Head not distinct; teeth equal. Scales keeled; anal and subcaudal scuta divided. Cephalic scuta of upper surface normal. Rostral not prominent; two internasals. Two nasals, one loreal which extends to the orbit. No preocular. Pupil round.

This genus embraces, as yet, but a single species. It is most nearly allied to *Haldea*, from which it differs only in the presence of two internasal plates. The species is little known.

AMPHIARDIS INORNATUS Garman.

Amphiardis inornatus GARMAN, N. Amer. Rept., 1883, p. 97.—COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 391.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 290.

The following description is copied from Garman:

Moderately stout, slightly depressed; head small, not distinct from the neck, subconical; tail short, tapering to a point. Snout short, blunt. Eye moderate. Nostrils anterior, directed horizontally in the anterior portion of the divided nasal. Nine head shields. Rostral very small, not reaching the top of the head. Two internasals (left smaller in each specimen). Loreal elongate, with the prefrontal forming the anterior border of the orbit. Prefrontals as broad as long. One post-orbital. Temporals 1+1. Labials five, third and fourth in orbit, fifth largest. Infralabials six, fifth largest. Posterior submentals half as large as the anterior. Scales carinate, lustrous, in seventeen rows; dorsal narrow; outer broad and faintly keeled; ventrals 125-129. Anal divided. Subcaudals thirty-six pairs.

Uniform brownish olive on the dorsal rows. No band on the occiput. Ventrals whitish, tinged with olive on the bases. Largest specimen, total length $10\frac{1}{2}$ inches; tail $1\frac{1}{2}$ inches.

Two specimens of this species are known, both found near Dallas, in northern Texas. I have had the opportunity of examining them in the Museum of Comparative Zoology through the kindness of Dr. Agassiz and Mr. Garman.

HALDEA Baird and Girard.

Haldea BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 122.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 290.

Conocephalus BIBRON, Prodrome des Ophidiens, 1853, p. 46.

Head elongated, ellipsoid, distinct from the body. Internasal plate single. Prefrontals large, entering together with the loreal into the orbit, thus suppressing the anteorbitals. Postorbital one. Two nasals. Pupil circular. Scales carinated. Postabdominal scutella bifid. Subcaudals divided.

This genus has the form and probably the habits of the Calamarinæ, but the continuity of the vertebral hypapophyses throughout the vertebral column and the characters of the hemipenis indicate that its affinities are with the Natricinæ, of which group it is probably a degenerate offshoot.

HALDEA STRIATULA Linnaeus.

Haldea striatula BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 122.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 35.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 291.

Coluber striatulus LINNÆUS, Syst. Nat., I, 1766, p. 375.—GMELIN, Linnæus Syst. Nat., 13th ed., 1788, p. 1887.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 354.

Calamaria striatula SCHLEGEL, Ess. Phys. Serp., 1837, p. 43.—HOLBROOK, N. Amer. Herp., III, 1842, p. 123, pl. XXIX.

Conocephalus striatulus DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 140.

Vertical plate elongated, hexagonal. Occipitals proportionately very long, subround exteriorly. Prefrontal subtriangular. Portion of postfrontals seen from above, oblong, dilated on the face, and approximat-

ing the postnasal and upper part of the orbit. Rostral tapering upward. Nostril opening in the posterior margin of the prenasal plate. Loreal elongated, situated above the second and third labials, and forming, with the postfrontal, the anterior part of the orbit. Eyes circular. Superciliaries proportionally large. One angular postorbital, elevated, the fourth labial forming the lower portion of the posterior part of the orbit. Temporal shields of medium size. Mouth deeply

cleft. Upper labials five; fourth and fifth very large. Inferior labials six; fifth disproportionately the largest.

Body slender, subcylindrical; tail short, and very much tapering. Scales lanceolated, in seventeen rows, all carinated, very narrow along the back; outer row conspicuously broader, with an obsolete carination.

Grayish brown above, soiled yellow beneath (said to be red-

dish gray above, and salmon-colored beneath, in life), a narrow light chestnut band across the middle of the occipitals, spreading over the angle of the mouth.

This small species is distributed over the Austroriparian district, and extends into the Eastern, but how far is as yet unknown. Fort Jackson, Minnesota, is the most northern locality in the following list, but for its accuracy I can not vouch. Richmond, Virginia, is the most northern locality in the East.

Haldea striatula Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1879	1	Charleston, South Carolina.	.....	Dr. S. B. Barker	Alcoholic type.
4751	2	Upshur County, Texas .....	.....	J. N. Glasco	Alcoholic.
5564	6	Grand Couteau, Louisiana .....	.....	St. Charles College	do.
7302	1	Somerville, North Carolina .....	.....	J. C. McNair	do.
2453	1	Milwaukee, Wisconsin .....	.....	Sercomb	do.
1877	1	Richmond, Virginia .....	.....	C. W. Reese	do.
1878	1	Kemper County, Mississippi.	.....	D. C. Lloyd	do.
4490	1	Fort Jackson, Minnesota.	.....	T. Glover	do.
9595	1	Wilmington, North Carolina.	Apr. —, 1878	John M. Harbfield	do.
10711	1	Nashville, Georgia	—, —, 1880	W. J. Taylor	do.
15555	1	Cook County, Texas .....	.....	G. H. Ragsdale	do.
17969	.....	Arkansas .....	.....	O. P. Hay	do.
22154-5	.....	Waco, Texas .....	.....	H. H. and C. S. Brimley ..	do.

TROPIDOCLONIUM Cope.

Tropidoclonium COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 76; Proc. Amer. Phil. Soc., 1886, p. 495; Bull. U. S. Nat. Mus., No. 32, 1887, p. 60.

Head not distinct from body. Teeth equal. Scales keeled; anal plate entire; subcaudal scuta divided. Cephalic scuta normal; two internasals, rostral not prominent. One nasal and one loreal. Hemipenis with two apical papillæ.

This genus shows its position to be in the Natricinæ by the presence of the vertebral hypapophyses on the posterior part of the column. In its entire anal plate, and in its pattern of coloration, it resembles the genus *Entania*, and especially such species as *E. brachystoma* Cope and *E. leptcephala* Baird and Girard, where the head is not very distinct. It is probably a terrestrial modification of that genus, as the *Natrix kirtlandii* is of *Natrix*. But one species of the genus is known. The peculiar apical papillæ of the hemipenis I find to be entirely constant.

TROPIDOCLONIUM LINEATUM Hallowell.

Tropidoclonium lineatum COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 76; Checklist N. Amer. Batr. Rept., 1875, p. 42.

Microps lineatus HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1856, p. 241.

Ichnognathus lineatus BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 289.

The head is quite small, rounded above, depressed in front; snout subacute; nostril in a single parallelogrammic nasal plate, quite near its superior margin, and much nearer its anterior than its posterior extremity; sometimes this plate is cleft inferiorly below the nostril; loreal longer than high; one anterior, two posterior orbitals; six superior labials, the eye resting on the third and fourth, the sixth longer than high. Temporals 2-2, the inferior of the first row not touching post-orbitals, and intercalated between the fifth and seventh superior labials. Pregeneials longer than postgeneials, the latter bounding the posterior part of the long fourth inferior labial. Body rather stout, thicker in the middle, covered with nineteen rows of scales, all of which are very strongly carinated, except the two inferior rows, which are quite smooth and deeper than the others; other scales narrow, subelliptical, bipunctate posteriorly, the carina reaching the

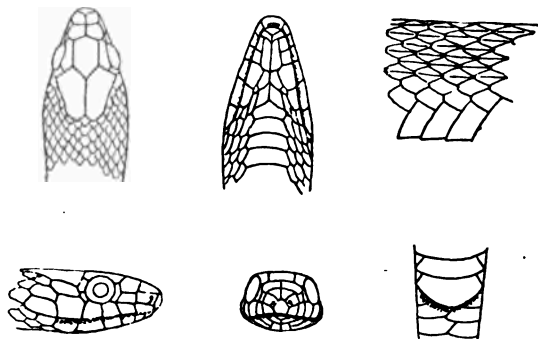


Fig. 273.

TROPIDOCLONIUM LINEATUM HALLOWELL.

× 2.

Fort Chadbourne, Texas.

Cat. No. 9059, U.S.N.M.

superior labials. Pregeneials longer than postgeneials, the latter bounding the posterior part of the long fourth inferior labial. Body rather stout, thicker in the middle, covered with nineteen rows of scales, all of which are very strongly carinated, except the two inferior rows, which are quite smooth and deeper than the others; other scales narrow, subelliptical, bipunctate posteriorly, the carina reaching the

entire length of the scale; tail short and tapering to a point; abdominal scuta, 138; subcaudals, 34; a single preanal.

Brown above, with three narrow yellow dorsal vittæ, the middle occupying one row and a half of the adjoining row of scales; head above brown; upper jaw light yellow; abdomen and under part of tail yellow, with a double row of triangular spots of a bluish-black color along the middle of the former and base of the latter; these spots are sometimes confluent at their bases; the spots beneath the epidermis are perfectly black.

This species is especially characteristic of the western part of the Mississippi Valley, occurring in the western part of the Eastern, and the Texan part of the Austroriparian subregions. It is not uncommon in northern Texas, the Indian Territory, and southern Kansas, extending north to Iowa and Ohio, inclusive.

Tropidocolonium lineatum Hallowell.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
2059	1	Fort Chadbourne, Texas.....	.....	Dr. E. Swift, U. S. A.	Alcoholic.
5238	1	Neosho Falls, Kansas.....	.....	B. F. Goss.....	do.
9575	2	"Southern States".....	.....	.....	do.
10088	1	Hughes, Ohio.....	Apr. —, 1879	R. T. Shepherd.....	do.
8038	1	.....	.....	.....	do.
14783	1	St. Louis, Missouri.....	.....	Julius Hurter.....	do.
15867	1	do.....	.....	.....do.....	do.
16236	3	do.....	.....	.....do.....	do.
16237		do.....	.....	.....do.....	do.
16238		do.....	.....	.....do.....	do.
16485	3	do.....	.....	.....do.....	do.
16486		do.....	.....	.....do.....	do.
16487		do.....	.....	.....do.....	do.
21497	1	Waco, Texas.....	.....	C. S. and H. H. Brimley..	do.

Mr. Julius Hurter, to whom I owe much information respecting the reptiles of Missouri, states that this species is very abundant within the city limits of St. Louis. A flood in the Mississippi at one time drove them from their subterranean haunts and many were captured.

LIODYTES Cope.

Liodytes COPE, Proc. Amer. Phil. Soc., 1884, p. 194; 1886, p. 495; Bull. U. S. Nat. Mus., No. 32, 1887, p. 60.

Posterior maxillary tooth longer than those in front of it and separated from them by an interspace. Cephalic plates normal, except that there is but one internasal plate. Nostril subvertical. Two nasal plates and one loreal. Scales smooth, no fossæ. Anal scutum divided.

This genus is allied to *Helicops* Wagler, a form found only in continental South America. It differs from it in the smoothness of the scales.

It includes but one species, which has been found so far in Florida only.

Scales in 19 rows; labials 8; internasal wider than long. Five rows of caudal scales keeled. Dark brown, with two lateral brownish yellow stripes on each side; below straw color..... *L. allenii*.

LIODYTES ALLENII Garman.*Liodytes allenii* COPE, Proc. Amer. Phil. Soc., 1886, p. 495.*Helicops allenii* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 275.

Body subcylindrical, retaining its size in the middle and tapering abruptly near the extremities; head not larger than the neck; nasal plates single, in contact between prefrontal and rostral; one prefrontal; loreal and anteorbital present; three postorbitals, not in contact with the temporals; two or more rows of carinate scales on the tail; color in longitudinal bands.

Body of moderate size, subcylindrical, tapering in the anterior and posterior fifths; head subconical, depressed continuous with the body; eyes medium, circular, distant from the end of the snout and from each other about one-fourth of the total length of the head; mouth inferior, deeply cleft, outline sharply curved in its posterior third; tail smaller than the body, tapering abruptly in the anterior third, posterior two-

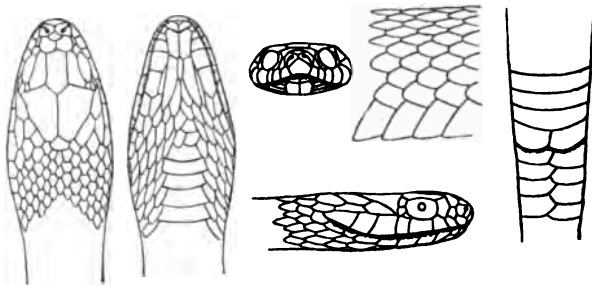


Fig. 274.

LIODYTES ALLENII GARMAN.

= 1.

Volusia, Florida.

Collection of E. D. Cope.

thirds slender. Rostral shield very small, five-angled; internasal small, rhomboid, posterior angle rounded, transverse diameter the greater; postfrontals six-sided, the smaller next the loreal, rounded angle backward; vertical moderate, six-angled, narrower forward; superciliaries shorter than the vertical, five-sided, narrow, wider above the postorbitals; occipitals larger, separated in front by the angle of the vertical; one loreal, small, four-sided, smaller next the frontal; nasals single, nearly elliptical, bearing the minute circular nostril to the lower posterior angle; upper labials eight, third and fourth entering into the orbit, sixth and seventh larger; lower eleven, fifth and sixth larger; five shields between labials and occipitals.

Scales of the body in nineteen rows, smooth, hexagonal, those in the vertebral rows twice as long as wide, in the exterior wider than long, those of the tail strongly keeled in the three vertebral rows, slightly in the next two; abdominals, 128; anal bifid; subcaudals, 58 pairs.

Color in longitudinal bands; the vertebral dark brown, five scales and two half scales in width, extending over the head to the upper portions of the rostral and labials; the first laterals of yellowish brown, from the occiput, two half scales wide; the second of dark brown, two scales and two halves; the exterior of brownish yellow, two scales and a half. The darker lateral edges of all the scales give the appearance of narrow stripes. Abdominals, subcaudals, lower part of head, upper labials, and rostral dull yellow or straw color. Without spots. It is likely that in life the dark bands were purplish or bluish and the light flesh colored.

Liodytes allenii Garman.

Catalogue No.	Locality.	From whom received.
21388	Florida	Dr. E. Lönnberg.
22700	Fort Basseger, De Soto County, Florida	R. Ridgway.

EUTÆNIA Baird and Girard.

Eutania COPE, Proc. Amer. Phil. Soc., 1886, p. 495.

Eutainia BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 24.

Thamnophis FITZINGER, Syst. Rept., 1843, p. 26.

Prymnodion COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 558.

Chilopoma COPE, Rept. Expl. Surv. W. of 100 Mer., V, 1875, p. 543 (preoccupied).

Stypocemus COPE, Proc. Amer. Phil. Soc., 1875, p. 387; Bull. U. S. Nat. Mus., No. 32, 1887, p. 60.

Cephalic plates normal; two nasals, one loreal. Eye resting on superior labials. Scales keeled, without pores. Anal plate entire; subcaudals divided. The maxillary teeth are rather abruptly longer near the posterior extremity of the maxillary bone than elsewhere, as in the genus *Natrix*, with two exceptions. These are the species *E. multimaculata* Cope and *E. melanogaster* Wiegmann. I have on this account distinguished these species as constituting another genus which I called *Atomarchus*, the character distinguishing it from *Eutania* being the equality in length of the maxillary teeth. As the excess in length of the posterior teeth is small in some of the species of the latter, I have not for the present retained this genus, although it may be found to be advisable to do so hereafter. The two species mentioned are more aquatic in their habits than the *Eutaniæ* proper.

This genus was established by Baird and Girard in the Catalogue of Serpents of North America, published in 1853, on species which had been previously referred to the genus *Natrix* (*Tropidonotus*). To the three species previously known these authors added four; and nine names were proposed for what are in my estimation either subspecies or individuals of the seven species actually distinguished. In the year 1860 Kennicott added five species. At various dates between 1860 and 1885 the present writer added nine species, and referred to the genus a species long previously described by Wiegmann. In 1890 Brown added a species, and a species is described for the first time in the present review. The total number of species is, then, twenty-four.

Eutæniæ are the most abundant snakes in North America and Mexico. Where all other species are absent, either through hostility of the climate or of enemies, individuals of this genus remain. This persistence may be ascribed to several causes. One of these is their great fecundity. Professor Baird mentions a specimen of *E. sirtalis* which produced eighty young at a birth. Another cause is their readiness to seek concealment in water, so that they most readily escape observation.

Several of the species are pugnacious in their disposition. Such is the case with the two which have the widest distribution and greatest abundance of individuals, the *E. sirtalis* Linnæus and *E. elegans* Baird and Girard. Their bite, it is needless to remark, is perfectly harmless. Some of the species possess great elegance of form, as those of the *E. saurita* group. Others have much brilliancy of color, as the metallic green of some forms of the *E. proxima* and the red and black of the *E. sirtalis concinna*.

The genus *Eutænia* presents especial attractions to the student who desires an illustration of the phenomena of variation and constancy in the physical characters of animals. In few genera do we find so well illustrated the persistence of specific characters exhibited side by side with variations of the same. We have here, therefore, examples of the appearance or disappearance, as the case may be, of characters in connection with or without apparent connection with the environment.

The species of *Eutænia* differ as follows:

I. Second, and usually first, row of scales keeled; orbit bounded below by two labial plates. Lateral stripe on the third and fourth rows of scales.

1. Temporal scales 1-2.

* Tail equal or exceeding one-third total length; first row of scales much longer than deep; strongly keeled; scales in 19 rows.

Superior labials 8, longer than high; very slender; color metallic olive.

E. sackenii Kennicott.

Superior labials 7, longer than deep; very slender; color brown.

E. saurita Linnæus.

** Tail less than a third and more than a fourth the total length; superior labials 8.

Head flat; superior labials longer than high; scales in 19 rows, inferior row keeled, longer than deep. *E. proxima* Say.

Head elevated, superior labials higher than long; scales in 21 rows, inferior row as deep as long. *E. megalops* Baird and Girard.

*** Tail more than one-fourth and not less than one-fifth the total length; scales in 21 rows, the inferior row as deep as long, and weakly or not keeled.

Superior labials 7; tail less than 4.5 times in total length.

E. radix Baird and Girard.

Superior labials 8; tail more than 4.5 times in total length.

E. macrostemma Kennicott.

2. Temporal scales 1-1.

Tail between one-fifth and one-fourth the total length; superior labials 7; head little distinct; lateral stripe bright and black bordered, on second, third, and fourth rows of scales. *E. butlerii* Cope.

Tail between one-fourth and one-third the total length; superior labials 8; head quite distinct; lateral line faint on third and fourth rows.

E. rutiloris Cope.

II. Second row of scales keeled; the first keeled or smooth; orbit above two labials; lateral stripe when present on second and third rows of scales.

1. Temporal scales, 1-2.

* Scales in 21 (3) rows; superior labials 8.

Two preoculars; superior temporals small; first row of scales keeled. black, stripes indistinct; head short, frontal wide.

E. biscutata Cope.

One preocular; superior temporals small; head short, frontal wider, not touching preocular; posterior labials higher than long; tail $3\frac{1}{2}$ to $4\frac{1}{2}$ times in length.....*E. elegans* Baird and Girard.

One preocular; a large superior temporal bounding occipital; frontal narrow, touching preocular; head long; labials all longer than high; tail $3\frac{1}{2}$ in length.....*E. angustirostris* Kennicott.

** Scales in 19 (17) rows; eight superior labials.

α Scales in 17 rows.

Slender; eye large; frontal narrow; head very distinct; no stripes nor lateral spots, except anteriorly.....*E. chrysocephala* Cope.

$\alpha\alpha$ Scales in 19 rows.

Form slender, head very distinct, eye large; dorsal stripe mostly on one row of scales, with the indistinct lateral stripe and belly white; a large black nuchal spot on each side....*E. eques* Reuss.

Form robust, head little distinct; dorsal stripe yellow; lateral stripe indistinct, like the belly, olive to black; no nuchal spot.

E. infernalis Baird and Girard.

Form stout, small; head little distinct; eye moderate; no stripes, but a series of cross bands which inclose large spots.

E. phenax Cope.

Form slender; small; eye moderate; no stripes, but six rows of small black spots.....*E. sumichrasti* Cope.

* * * Scales in 19 (17) rows; superior labials seven.

α Two preoculars (sometimes united).

Head scarcely distinct; two or three rows of spots on each side.

E. leptcephala Baird and Girard.

$\alpha\alpha$ One preocular; inferior labials ten.

Head scarcely distinct; postgenaeals short; bands indistinct, connected by a single series of brown crossbars on each side.

E. scalaris Cope.

Head little distinct; form slender; stripes very distinct, yellow, separated by black or brown; the scales with yellow keels; lateral, band black bordered below.....*E. pulchrilatus* Cope.

Form stout, head distinct; postgenaeals longer than pregenaeals; two rows of spots on each side, sometimes connected longitudinally above or below; stripes pale.....*E. sirtalis* Linnaeus.

* * * Scales in 19 rows; superior labials six.

Inferior labials eight; head not distinct; gastrosteges 132; dark olive with pale dorsal stripe.....*E. brachystoma* Cope.

2. Temporal scales, 3-2.

* Scales in 21 rows; superior labials eight.

Frontal wide, reaching preoculars; second row of scales as wide as first; stripes distinct; a broad black band below lateral stripe; labials brown bordered.....*E. nigrilatus* Brown.

III. Second row of scales keeled; orbit bounded below by a single labial.

* Scales in 21 rows; superior labials eight.

1. Temporals, 1-3.

Oculars, 3-3; labials longer than high; loreal longer than high; rostral subtriangular; muzzle narrow; seven rows of spots, no stripes.

E. multimaculata Cope.Like the last; but rostral a transverse oval with free borders; loreal nearly entering orbit, and labials narrower... *E. rufopunctata* Cope.

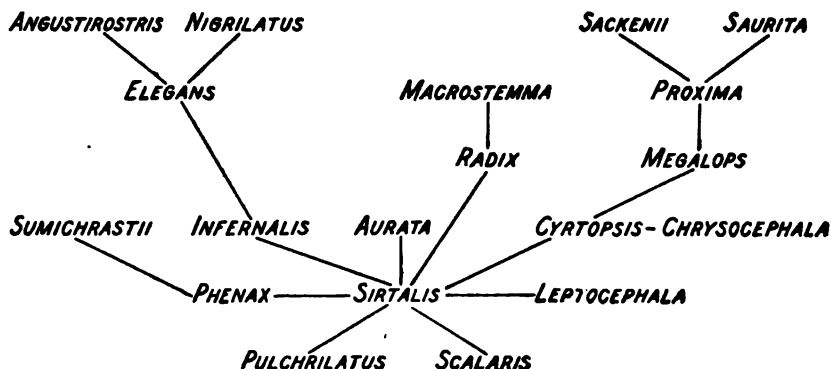
IV. Second row of scales smooth like the first; others with weak keels. Orbit bordered by two labials.

* Scales in 19 rows; superior labials eight.

1. Temporals, 1-2.

Oculars, 2-3; loreal longer than high; head little distinct; dusky stripes wanting or indistinct..... *E. melanogaster* Wiegmann.

The affinities of these species may be expressed in the following diagram:



The *E. sirtalis* presents the greatest number of points of contact with other species. It also inhabits the region of geologically the greatest age, or that region which has been a frog land area for the longest time. Although large portions of the west of North America were elevated at the close of the Cretaceous period, and probably before the genus *Eutania* was in existence, the ancestors of *Eutania* may be safely believed to have inhabited the area which was land prior to the Cretaceous, so that the descent of *Eutania* was new and possibly in the eastern rather than in the western half of the continent. It is thus rendered probable that *Eutania sirtalis* is the ancestral form. This is also confirmed by the fact that it is a spotted species, since the unicolor species, as *E. saurita*, have spotted young.

The following table represents the geographical range of the species:

Eastern region.	Austroriparian region.	Central region.	Pacific region.	Sonoran region.	Central American region.
<i>E. saurita</i>	<i>E. sackenii</i> <i>E. saurita</i> <i>E. proxima</i>				
<i>E. butlerii</i>		<i>E. radix</i>		<i>E. megalope</i> .. <i>E. macrostemma</i>	<i>E. proxima</i> <i>E. rutiloris</i> .
		<i>E. elegans</i>	<i>E. elegans</i> <i>E. biscutata</i>	<i>E. elegans</i>	
				<i>E. augustirostris</i> <i>E. eques</i>	<i>E. eques</i> <i>E. chrysocephala</i> <i>E. phenax</i> <i>E. sumichrasti</i> <i>E. scalaris</i> <i>E. pulchrilatus</i> .
<i>E. sirtalis</i>	<i>E. sirtalis</i>	<i>E. sirtalis</i>	<i>E. infernalis</i> <i>E. sirtalis</i>		
<i>E. brachystoma</i>			<i>E. leptocephala</i>	<i>E. pulchrilatus</i> .. <i>E. nigrilatus</i> .. <i>E. rufopunctata</i> <i>E. multimaculata</i> <i>E. melanogaster</i>	

The above table gives but a very general view of the distribution of the species, since some of them are restricted to districts of the regions only, while a few species are known from so few examples that their range is unknown. Of the latter class are *E. butlerii*, *E. brachystoma*, *E. rutiloris*, *E. augustirostris*, and *E. nigrilatus*. The *E. sackenii* is restricted to Florida, and the *E. radix* to that part of the central region that lies east of the Rocky Mountains, entering the eastern region. The widely distributed species, as *E. sirtalis* and *E. elegans*, are represented in special districts by peculiar subspecies, which look very different from each other. The *E. proxima* has a range which does not coincide with any zoological district, inhabiting eastern Mexico, Texas, and the Mississippi Valley.

The study of the several hundred specimens of species of this genus which are contained in the U. S. National Museum and my private collection shows that in most of the species the number of rows of scales and the number of the labial plates are quite constant. In only one species, the *E. leptocephala*, is the number of scale rows varied by the presence or absence of a single row on each side, and in none is the number of labial plates frequently variable. The position of the lateral stripe is, as stated by Baird and Girard, very constant. The relative length of the tail is constant within certain limits and in certain species. In some of the species it varies a good deal. The coloration varies within limits in each species, and often characterizes subspecies with considerable precision, transitional forms in some such cases being rare and in others more frequent. The species of the Pacific coast present the greatest difficulties to the systematist. Here the eastern *E. sirtalis* comes into contact with the western *E. elegans*, and some close parallels in coloration occur. Thus the *E. s. parietalis* resembles very much the *E. elegans ordinoides*, and the *E. s. sirtalis* resembles considerably the *E. e. lineolata*. The *E. infernalis* intervenes between

the *E. sirtalis* and *E. elegans* in scale formulæ. The *E. leptcephala* appears quite distinct from the southern west coast forms, but it has melanistic phases which resemble melanistic forms of the *E. sirtalis* from the northwest coast in Washington, such as *E. s. pickeringii*.

The colors of the young afford some clew to the order of probable appearance of color marks in the adults. As already remarked by Baird and Girard, the spots are more distinct in the young than in adults, both as to isolation from each other and in distinctness of color. When spots disappear and are replaced by a uniform tint, both lighter (*E. elegans vagrans*) and darker (*E. elegans lineolata* and *E. sirtalis obscura*), the change first appears on the posterior part of the body. The tendency to form cross-bars or spots appears first on the anterior part of the body. This is slightly developed in the *E. sirtalis semifasciata* but extends throughout the greater part of the length in the *E. phenax*. In species in which the top of the head is pale, as *E. elegans vagrans*, it is very dark or black in the young. This dark color is paler also in the *E. e. couchii*, and in the *E. e. marciana*, but leaves its posterior portion as a pair of large black nuchal spots.

EUTÆNIA SACKENII Kennicott.

Eutania sackenii KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1859, p. 98.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 40.—COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 393.

Tropidonotus saurita BOULENGER, part, Cat. Snakes Brit. Mus., I, 1893, p. 212.

Prymnodon chalcus COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 558.

Tail, with rare exceptions, more than one-third the total length; body very slender; head quite distinct from body, elongate and with narrow muzzle. Eye rather large; ocular plates 1-3; superior labials eight, eye resting on fourth and fifth. Temporals 1-2. Scales of body in nineteen rows, very narrow, more strongly keeled than in any other species of the genus and notched at the tips. The inferior row differs but little from the others, the scales being a little deeper at the base.

Color, bright olive above, differing in depth; below light leek green; generally with metallic reflections. Three longitudinal straw-colored stripes; the lateral on the third and fourth rows; the

vertebral on the median and halves of adjacent rows of scales, all narrowly dark brown bordered. Sometimes the color of the dorsal stripe is like that of the rest of the back, the borders only remaining

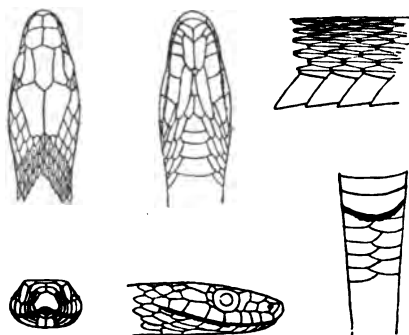


Fig. 275.

EUTÆNIA SACKENII KENNICOTT.

= 1.

Little Sarasota Bay, Florida.

Cat. No. 9502, U.S.N.M.

and sometimes these also disappear. In the type specimen the dorsal stripe is represented by a half-inch posterior to the head; no spots or markings on the gastrosteges.

In seven specimens the proportion of the tail to the total length is as follows: Cat. No. 10589, two and three-fourths, two and four-fifths; Cat. No. 10693, two and four-fifths; Cat. No. 11987, two and five-sixths, two and nine-tenths, two and nine-tenths; Cat. No. 12596, three.

This species is distributed over Florida generally, and ranges as far westward as Mobile, Alabama, from which point specimens were sent me by my friend, Dr. Joseph Corson, United States Army. It is the most slender species of the genus, and is characterized by the form of the first row of scales. These are narrow, differing very little from those of the other rows. Like them they are strongly keeled, and are notched at the apex. The form originally described has no dorsal stripe. Specimens of this kind were sent me from Volusia. Specimens from Georgiana, belonging to the U. S. National Museum, and from Mobile have a dorsal stripe with blackish borders. Two Volusia specimens have seven superior labials, while one has eight. Two specimens from Mobile have eight superior labials, and ten from other parts of Florida have the same. In one of the specimens from Georgiana the colors, including the stripes, are obscure.

Eutænia sackenii Kennicott.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8901	1	Palatka, Florida	Apr. —, 1877	Prof. S. F. Baird	Alcoholic.
4502	2	do .....	.....	T. Glover	do.
4503	1	.....	.....	.....	do.
9502	1	Little Sarasota Bay, Florida.	— —, 1874	Prof. F. B. Meek	do.
10589	1	Clearwater, Florida	July 14, 1879	S. T. Walker	do.
12506	1	Gainesville, Florida	Apr. —, 1882	James Bell	do.
10693	.....	.....do .....	.....	.....do	do.
11987	3	Georgiana, Florida .....	.....	Wm. Wittfield	do.
22333	.....	Orange Hammock, De Soto County, Florida.	.....	Wm. Palmer	do.
22339	.....	Kissimmee River, Osceola County, Florida.	.....	.....do	do.

EUTÆNIA SAURITA Linnaeus.

Eutænia saurita COPE, Check-list N. Amer. Batr. Rept., 1875, p. 40.

Coluber saurita LINNÆUS, Syst. Nat., I, 1766, p. 385; Syst. Nat., 13th ed., I, Pt. 3, 1788, p. 1109.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 352.—STORER, Rep. Rept. Mass., 1829, p. 229.—THOMPSON, Hist. Vermont, 1842, p. 115.

Leptophis sauritus HOLBROOK, N. Amer. Herpt., III, 1842, p. 21, pl. iv.—DEKAY, New York Fauna, 1842, p. 47, pl. xi, fig. 24.

Tropidonotus saurita SCHLEGEL, Ess. Phys. Serp., I, p. 169; II, p. 323.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 586.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 72.—BOULENGER, part, Cat. Snakes Brit. Mus., I, 1893, p. 212.

Eutænia saurita BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 24.

Elongate and slender; tail generally longer; sometimes equal, one-

third the total length. Head quite distinct from body, elongate, flat. Orbital plates, 1-3; temporals, 1-2; superior labials seven, those beneath the orbit longer than high. Scales in nineteen rows, very narrow, strongly keeled, and notched at the apex, those of the inferior row differing only from the others in being a little deeper at the base.

Color about light chocolate. Three stripes of uniform yellow. Below the lateral stripes, light brown. Abdomen greenish white. A broad vertebral line of sulphur yellow, occupying one and two half rows of scales, the line margined for half a scale on each side with black. A lateral stripe on each side along the third and fourth rows of lateral scales; the scales in the exterior edges of this stripe occasionally speckled or margined with black. Skin between the scales black, with numerous small yellow lines, half a scale long, seen only in dilating the skin. In some species the black shows as a series of lateral spots.

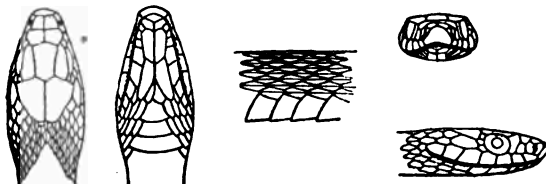


Fig. 276.

EUTÆNIA SAURITA LINNÆUS.

= 1.

Connecticut.

Cat. No. 7224, U.S.N.M.

The usual double spot on the line of union of the occipitals. Orbital plates yellowish white, as are the lower part and sides of the head and throat.

In a specimen from Westport, New York, there is a well-defined black line under the lateral stripe. In one from Londongrove, Pennsylvania, two rows of quadrate spots are visible on the anterior part of the body as in *E. sirtalis*. Spots are not visible in any other specimen.

The scuta, scutellæ, and lengths of body and tail in inches are given in three specimens by Baird and Girard, as follows:

Cat. Nos.	Locality.	Gastrosteges.	Urosteges.	Length.	Tail.
782.	Carlisle, Pennsylvania.....	156.	115.	35.	12½.
	Do	157.	118.	26½.	9.
†	Washington, District of Columbia.....	157.	118.	32½.	9.

The lengths of the tail in fourteen specimens are as follows: Cat. No. 685, two and three fourths; Cat. No. 12369, two and four-fifths; Cat. No. 795, two and six-sevenths; Cat. No. 987, two and seven-eighths; Cat. No. 782, two and seven-eighths; Cat. No. 9997, two and nine-tenths; Cat. No. 13357, two and nine-tenths; Cat. No. 9991, two and fifteen-sixteenths; Cat. No. 7223, two and nineteen-twentieths; Cat. No. 8953, three; Cat. No. 797, three; Cat. No. 7224, three; Cat. No. 783, three and one-fourteenth; Cat. No. 5451, three and one-eighth. Of these, three with the shortest tails—Cat. Nos. 797, 8953, and 5451—are young individuals.

The superior labials are constantly seven in twenty-six specimens examined.

A series of small spots along the superior edge of the lateral stripe is seen in the only young specimen in the collection.

The seven superior labials and the color distinguish this species from the *E. sackenii*. The carination of the scales is also not so strong as in the latter.

The *Eutania saurita* ranges the eastern and austroriparian districts, except Florida and Texas. Specimens in Yarrow's Check-list said to be from the latter districts belong to the *E. sackenii* and *E. proxima*, respectively. It is especially abundant in the Middle States, but is not known to extend north of Massachusetts. It is an elegant creature, and is generally found near water, in which it swims readily, being more aquatic in its habits than the *E. sirtalis*, which is found in the same localities.

Eutania saurita Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
787	1	Somerville, North Carolina	— —, 1854	J. C. McNair	Alcoholic type.
987	1	Pensacola, Florida		Dr. W. A. Hammond, U. S. A.	Alcoholic.
797	1	Lancaster, Massachusetts		Prof. S. F. Baird	do.
17221	1	Tennessee		Prof. R. Owen	do.
17222	1	Tioga County, New York		E. E. Howell	do.
5451	1	Toledo, Ohio		J. B. Trembly	do.
885	3	New Orleans, Louisiana			do.
7223	1	Indiana County, Pennsylvania		J. W. Dugins	do.
782	4	Carlisle, Pennsylvania		Prof. S. F. Baird	do.
5552	1	Savannah, Georgia		R. V. Lloyd	do.
7224	1	Connecticut		C. Wright	do.
795	2	Virginia		C. Sanford	do.
8953	1	Woods Hole, Massachusetts	— —, 1875	V. N. Edwards	do.
9991	1	Middletown, Connecticut		W. H. Barnes	do.
9997	1			Museum Wesleyan University	do.
10657	1	Wheatland, Indiana	Apr. —, 1881	Robert Ridgway	do.
783	2	Illinois		R. Kennicott	do.
12369		London Grove, Pennsylvania		E. D. Cope	do.
12356		Wheatland, Indiana		Robert Ridgway	do.
12357		do		do.	do.
14759-81		Des Moines, Iowa		R. Ellsworth Call	do.
17455		Washington, District of Columbia		J. D. Figgins	do.

EUTÆNIA PROXIMA Say.

Eutania proxima COPE, Check-list N. Amer. Batr. Rept., 1875, p. 40.

Coluber proximus SAY, Long's Exped. Rocky Mts., I, 1823, p. 187.—HARLAN. Journ. Acad. Nat. Sci. Phila., V, 1827, p. 353.

Tropidonotus proximus BOIE, Isis von Oken, 1827, p. 535.

Eutania proxima BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 25.

Eutania faireyi BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 25.

Body and tail elongate, slender, but less so than in the *E. saurita* and *E. sackenii*, the tail constituting less than one-third and more than one-fourth the total length. Head quite distinct, elongate, rather depressed. Ocular plates 1-3; temporals 1-2; superior labials longer than broad below the orbit. Scales in nineteen rows, very narrow, strongly keeled,

and notched at the tip; those of the first row distinctly wider than the others, and very indistinctly or not notched at the apex, although strongly keeled.

Deep brown to black above and on the sides; beneath greenish white. Dorsal stripe on one and two half rows of scales, ochraceous yellow, lateral stripe on the third and fourth row of scales, greenish yellow or white, markedly different in tint from the dorsal. Sides of abdominal scutellæ and first and second dorsal series of the same color as the back. On stretching the skin numerous short white lines are visible. Occipital plates with two small approximated spots on the line of junction. Orbitals whitish. The greenish white of the abdomen becomes more yellow anteriorly.

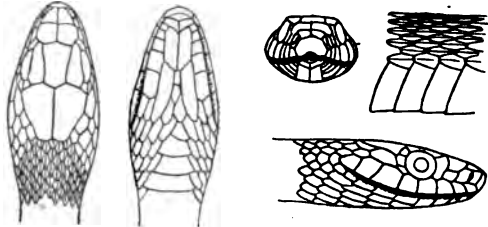


Fig. 277.

EUTANIA PROXIMA SAY.

= 1.

Between Pecos and Rio Grande, Texas.

Cat. No. 742, U.S.N.M.

Baird and Girard give the following numbers of scuta and scutellæ and lengths of tail and total in inches:

Locality.	Gastrosteges.	Urosteges.	Scales	Length.	Tail.
Prairie Mer Rouge, Louisiana	178.	115.	19.	30 $\frac{1}{4}$.	10.
Do	174.	114.	19.	26 $\frac{1}{2}$.	8.
Do	168.	—	19.	29.	—
Red River	170.	100.	19.	33.	9.
New Braunfels, Texas	171.	100.	19.	25 $\frac{1}{4}$.	7 $\frac{1}{2}$.
Near Indianola	170.	105.	19.	15 $\frac{1}{2}$.	4 $\frac{1}{2}$.
Do	178.	108.	19.	19.	5 $\frac{1}{2}$.
San Pedro, Texas	169.	105.	19.	14.	4.

The relative lengths of the tail to the total in seventeen specimens are as follows: Cat. No. 761, three and five-sevenths; Cat. No. 742, three and four-fifths; Cat. No. 5488, three and one-half; Cat. No. 5180, three and two-fifths; Cat. No. 5487, three and three-fifths; Cat. No. 757, three and one-seventh; Cat. No. 759, three and one-seventh; Cat. No. 741, three and one-fourth; Cat. No. 5484, three and one-third; Cat. No. 755, three and one-half; Cat. No. 753, three and two-fifths; Cat. No. 12036, three and one-sixth; Cat. No. 12110, three and one-fifth; Cat. No. 10726, two and two-fifths; Cat. No. 12906, three and one-third; Cat. No. 13010, three and two-fifths; Cat. No. 13011, three and one-half.

In thirty-eight specimens the labials are constantly eight above; in one specimen (Cat. No. 13051) they are eight on one side and seven on the other, and in one (Cat. No. 13050) they are seven on both sides.

A young specimen of 300 mm. is unspotted.

The *Eutania proxima* ranges throughout the Mississippi Valley to the mouth of the Mississippi River, throughout Texas from Dallas to

the mouth of the Rio Grande, and in eastern Mexico as far south as Orizaba. The individuals from the Mississippi Valley from New Orleans to Indiana and Wisconsin are generally blacker above than Texan specimens, and they have been regarded as a distinct species under the name of *E. faireyi*. This is, however, only a melanistic phase of the *E. proxima*. Specimens occur in my collection from Dallas, Texas, and another black one in the U. S. National Museum comes from so far west as Fort McKavett, which formerly stood on the Upper Llano River.

Besides the shorter tail, this species is readily known from the two species just before described, by the increased difference in form between the scales of the first and those of the other rows. Their form is distinctly different from that of the latter, but the diversity is not so great as in the *E. radix* and other species which follow.

A remarkable variety of this species comes from Fort Stockton, Texas. A pale shade represents the dorsal stripe, and the generally green colors are metallic in their luster. (Cat. No. 5180.) The proportions and scales are entirely normal.

Eutania proxima Say.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
7245	2	Headwaters of Colorado.		Capt. John Pope, U. S. A.	Alcoholic.
761	1	Brownsville, Texas.		Capt. S. Van Vleet, U. S. A.	do.
5180	2	Fort Stockton, Texas.		Patrick Duffy.	do.
742	1	Pecos and Rio Grande, Texas.		Dr. C. B. R. Kennerly.	do.
741	1	Calcasieu Pass, Louisiana.		G. Wurdemann.	do.
5488	2	Grand Coteau, Louisiana.		St. Charles College.	do.
5487	2	Jalapa, Mexico.		R. M. D'Oca.	do.
149	1	Sierra Sun, Mexico.	Apr. —, 1855	Capt. John Pope, U. S. A.	do.
731	1	Fox River, Wisconsin.		Prof. S. F. Baird.	do.
5484	1	Matamoras, Mexico.		Lieutenant Couch, U. S. A.	do.
759	1	Red River, Arkansas.		Capt. R. B. Marcy, U. S. A.	do.
753	1	San Pedro, Rio Grande.		Col. J. D. Graham, U. S. A.	do.
754	1	Medina, Texas.		do.	do.
755	2	Orizaba, Mexico.		do.	do.
5486	1	Fort Riley, Kansas.		do.	do.
9113	1	Wilmington, North Carolina.		do.	do.
759	1	Caderita, N. Leon.		Lieutenant Couch, U. S. A.	do.
669	2	North Pecos River, Texas.		W. S. Wood.	do.
757	1	Fort McKavett, Texas.		Dr. W. W. Anderson.	do.
5260	1	Fort Cobb, Texas.		do.	do.
8940	1	do.		Lieut. W. L. Carpenter, U. S. A.	do.
8061	1	Rock Island, Illinois.		do.	do.
8062	1	Chicago, Illinois.		do.	do.
752	1	Prairie Mer Rouge, Louisiana.		James Paine.	do.
5081	2	Wheelock, Texas.		F. Kellogg.	do.
776	1	Racine River, Wisconsin.		Prof. S. F. Baird.	do.
767	1	Verdigris River, Indian Territory.		do.	do.
7226	1	St. Louis, Missouri.		Dr. Geo. Englemann.	do.
771	1	Mississippi.		Dr. B. F. Shumard.	do.
5237	1	Neosho Falls, Kansas.		B. F. Goss.	do.
10726	1	Texas.		George B. Sennett.	do.
10060	1	St. James Parish, Louisiana.	Apr. —, 1879	O. de la Peichardière.	do.
12036	3	Mount Carmel, Illinois.	Nov. —, 1881	L. M. Turner.	do.
9964	1	Southern States.		do.	do.
9252	1	Illinois.		R. Kennicott.	do.
12110	1	St. James Parish, Louisiana.		O. de la Peichardière.	do.
12906					

Eutania proxima Say—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
13001 to 13070 17952	}	New Orleans, Louisiana		Dr. R. W. Shufeldt	Alcoholic.
		Veedersburg, Fountain County, Indiana.		O. P. Hay	do.
17958		Vicksburg, Mississippi		do.	do.
17965		do.		do.	do.
22326		Kerrville, Texas		Hy. Caudlin	do.
15370		New Orleans, Louisiana		Dr. R. W. Shufeldt	do.
15343		Matamoras, Mexico		Dr. D. W. Prentiss	do.
17033 to 17047	}	Cameron County, Texas		C. K. Worthen	do.

Specimens referred to this species said to be from North Carolina, in Yarrow's Check-list, are either the *E. saurita* or are inaccurate as to locality.

EUTANIA MEGALOPS Kennicott.

Eutania megalops KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 330.—COPE, Proc. Amer. Phil. Soc., XXII, 1885, p. 173; Check-list N. Amer. Batr. Rept., 1875, p. 41.

Form shorter and stouter, with proportionally shorter tail than in *E. proxima*, which this species slightly resembles. Tail one-fourth of the total length. Eye very large, greater than in *E. proxima*. First dorsal row of scales broader, each scale as high as long, and less strongly carinated. Dorsal strip narrow, covering one and less than two half rows of scales. Color uniform brownish ash, with the three longitudinal strips whitish yellow. Head olive ash.

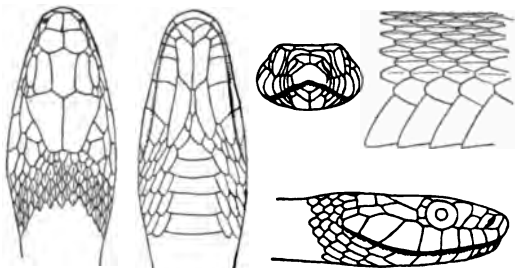


Fig. 278.

EUTANIA MEGALOPS KENNICOTT.

= 1.

Tucson, Arizona.

Cat. No. 965, U.S.N.M.

Color uniform dull brownish ash or clay color, with the dorsal and lateral strips whitish yellow. A few of the scales have narrow black spots on their edges, but these are not prominent, and never extend over a scale, appearing as indistinct mottlings of black on the ground color, always on the rows next the strips. The head above is light olive ash. The lateral strip is on the third and fourth rows, and is narrower than in *E. proxima*, covering rather less than two scales. The color below the lateral stripe is a little lighter than that of the back. The exterior dorsal row is much wider than in any of the allied species, each scale being as high as long. The second row is much narrower, though a little wider than the third. The eye is strikingly large and

the superciliaries are raised, rendering the fore part of the crown an inclined plane, yet the muzzle is higher than in *E. proxima*.

The *Eutania megalops* connects the species of the *E. saurita* group with the ordinary types of the genus with the larger number of lateral plates and dorsal scales. It is confined to our southwestern border and to the northern part of Mexico. It is evidently the most abundant snake in Chihuahua. The large number of specimens sent from near the city of that name display very little variation, and agree with one from New Mexico, described by me as above. The lateral band generally occupies only the third row of scales, but sometimes borders the fourth. The dorsal band very frequently occupies but one row of scales, but occasionally covers the halves of the adjacent rows. Cat. Nos. 14226-27-58-59-60-67-77-85-89-92.

I took a specimen on Duck Creek, which is a tributary of the Gila in southwestern New Mexico. It was in swampy ground near the water.

Eutania megalops Kennicott.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
765	1	Tucson, Arizona.....	.....	Maj. W. H. Emory, U. S. A.	Alcoholic.
8056	1	Camp Grant, Arizona .....	.....	E. Palmer	do.
7247	1	Mexico .....	.....	Major Rich	do.
7248	1	Chihuahua, Mexico.....	.....	Dr. T. H. Webb	do.
8418	1	Rio Grande, Colorado.....	June —, 1878	H. W. Henshaw	do.
.....	10	Chihuahua, Mexico.....	.....	E. Wilkinson	do.
16502	.....	Yuma, Arizona.....	.....	C. R. Orcutt	do.
16957	.....	Tucson, Arizona.....	.....	P. L. Jouy	do.
17146-7	.....	do .....	.....	Herbert Brown	do.
17558	.....	do .....	.....	do	do.

EUTÆNIA RADIX Baird and Girard.

Eutania radix COPE, Check-list N. Amer. Batr. Rept., 1875, p. 40.

Eutainia radix BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 34.

Eutania haydenii KENNICOTT, Rept. U. S. Pac. R. R. Surv., XII, Suppl. I, 1859, p. 298.

Tropidonotus ordinatus var. *radix* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 211.

Form rather robust, tail less than one-fourth the total length. Head moderately distinct, muzzle rather short, eye not enlarged. Scales in twenty-one longitudinal rows; the inferior row as deep as long, smooth or nearly so, and not at all or very feebly notched at the apex. Scales of second row not very strongly keeled, and feebly or not notched. Scales of other rows more elongate, strongly keeled, and feebly or not notched. Internasals and prefrontals wider than long; frontal much wider than superciliaries, much shorter than parietals. Loreal small, as high as long; oculars, 1-3. Temporals, 1-2-3. Superior labials seven, all higher than long except the first and seventh. Inferior labials nine; postgenaeals larger than pregenaeals.

Color different shades of brown, with three longitudinal light-yellow stripes. The latter occupy more or less of the third and fourth rows

of scales on each side, and the median row with the adjacent halves of the adjacent rows. The brown space between the stripes is marked by two alternating rows of square blackish spots, and a single similar row marks the brown ground below the lateral stripe. Belly greenish white; each gastrostegite with a black spot near the lateral extremity, extending various distances from the base. The superior labial plates are bordered posteriorly with black, sometimes narrowly, sometimes broadly. The color of the sides is continued onto the head, without the isolation of the anterior portion as a black spot on each side of the nape. Sometimes the superior labials are bordered with black posterior to the postoculars, sometimes not.

In twenty-nine specimens I have found three with eight superior labials on one side, and two with eight on both sides. In eighteen specimens I have found one with nineteen rows of scales, and this one is the type of Baird and Girard's original description.

This is a species of the central plains, not passing the Rocky Mountains to the west. It extends south as far as Dallas, Texas, and north into Canada, and east to Lake Michigan and Ohio, exclusive.

There are three color forms of this species which do not differ sufficiently to deserve distinction as subspecies. The species from northern localities, including the type, are dark colored, the ground color obscuring the spots, which can be, nevertheless, always discerned. Southern individuals are much lighter colored, the ground being a light olive, so that the spots both above and below the lateral stripe are very distinct, and the lateral stripe is little contrasted. The third form, represented by two specimens from Indiana, is also brightly colored, and the spots on the ends of the gastrosteges are prolonged posteriorly so as to form a black stripe on each side of the abdomen; but this is interrupted, the stripe being only continuous in sections, including from two to five scuta.

The first of these color forms includes the type specimen, which has, however, the stripes a little narrower than usual, and has the peculiarity of having only nineteen rows of scales. To the average typical form the name *E. radix turingii* Coles and Yarrow, has been given. The second form is the *Eutania haydenii* Kennicott. The other is the *E. r. melanotania* Cope.

Cat. No. 719, type; gastrosteges 153-1; urosteges 51; length 568 mm.; tail 122 mm.

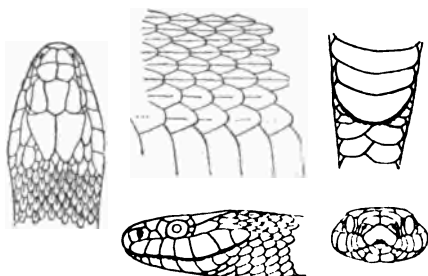


Fig. 279.

EUTANIA RADIX BAIRD AND GIRARD.

— 1.

Mouse River, Montana.

Cat. No. 9538, U.S.N.M.

Cat. No. 9537, type of *E. r. twiningii*; gastrosteges 166-1; urosteges 65. Type of *E. r. melanotænia*; length, 285 mm.; tail, 65 mm.

The *Eutania radix* resembles considerably the *E. sirtalis*. The increased number of rows of scales and different positions of the lateral stripe distinguish it.

Eutania radix Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
9537	1	Milk River, Montana.....	July 15, 1874	Dr. E. Coues, U. S. A.....	Alcoholic.
9540	1	Frenchmans River.....	—, 1874-5	Russell.....	do.
9541	1	do.....	—, 1873	Dr. E. Coues, U. S. A.....	do.
9539	1	Turtle Mountain, Montana.....	July 22, 1873	do.....	do.
9538	1	Mouse River, Montana.....	June 5, 1873	do.....	do.
719	1	Racine, Wisconsin.....		Dr. P. R. Hoy.....	Alcoholic type.
8058	2	Fort Snelling, Minnesota.....			do.
5485	1	Fort Ripley, Minnesota.....			do.
666	5	Platte River, Missouri.....			do.
712	1	Fort Benton, Missouri.....			do.
7246	1	Bridgers Pass, Wyoming.....		W. S. Wood.....	do.
7241	1	Fort Union, New Mexico.....		J. B. Mollhausen.....	do.
9528	1	Pembina.....		Dr. E. Coues, U. S. A.....	Alcoholic and young.
9529	1	do.....	June —, 1873	do.....	Alcoholic.
9530	1	do.....	June —, 1873	do.....	do.
9531	1	Mouse River, Montana.....	Aug. 10, 1873	do.....	do.
722	2	Nebraska.....		M. Walker.....	do.
12035	1	Mount Carmel, Illinois.....	Nov. —, 1881	L. M. Turner.....	do.
525		Pole Creek, Nebraska.....			do.
9535		Northern Boundary Survey.		Dr. E. Coues, U. S. A.....	do.
5355 a		Nebraska.....		?	do.
9250		Lake Winnipeg.....		D. Gunn.....	do.
1044	11	Racine, Wisconsin.....	—, 1853	Prof. S. F. Baird.....	do.
8058	1	Fort Snelling, Minnesota.....			do.
668		Nebraska.....		Lieutenant Bryan.....	do.
605		Bridgers Pass, Wyoming.....		Dr. Hammond.....	do.
8581		Pueblo, Colorado.....		H. W. Henshaw.....	do.
9719		Wyoming.....	June 10, 1876	Lieut. Crawford, U. S. A.....	do.
711		Yellowstone River.....		Dr. F. V. Hayden.....	do.
707		Fort Pierre, Nebraska.....			do.
18014		St. Louis, Missouri.....		Julius Hurter.....	do.
21270		Chadron, Nebraska.....		U. S. Fish Commission.....	do.
21257		Platte River, Nebraska.....		do.....	do.
22404		Regina, Assinibolia.....		John Macoun.....	do.
22406		Rush Lake, British North America.....		do.....	do.
22646		Canada.....		Dr. B. W. Evermann.....	do.

Dr. Henry Brous thus writes of the habits of the *Eutania radix*:¹

Several of the summers I passed upon the plains were preceded by rainy springs, swelling to unusual height the small streams, which became inhabited by small fishes. During the drought of hot summers the receding waters left the fishes in shallow pools within creek beds, an easy prey to their numerous enemies.

The midday heat caused numbers of snakes to seek shelter from the sun, and the garter snake (*Eutania radix*) in particular chose water at this time. Here the fishes, unable to escape or to find deep water, were unwilling cotenants with the snakes. The latter are fond of fish, and would devour great numbers of the smaller ones, chasing them from one part of the shallow pool to another. When the fishes were in water too shallow to swim in, or were struggling upon the sand, they would be seized by the snakes, who would feed upon them until unable to contain more. The snakes would follow the fish through the water, diving and remaining submerged some time. I did not observe them swallow air (see Am. Nat., Jan., 1880). Snakes

¹American Naturalist, XVI, 1882, p. 564.

evince more than ordinary energy and sagacity in capturing fish; half a dozen will congregate within a small pool, all acting in concert.

Mr. J. L. Wortman, who had charge of a scientific party last year, informs me that while fishing one day he caught numbers of chub (*Cyprinidae*) and, throwing them on the sand, was surprised to see that but few remained. While quietly continuing to replace those so singularly missing, he observed a garter snake seize and swallow one of the fish 6 inches in length. There were two of these snakes reaping the reward of Mr. Wortman's skill. Upon opening the snakes one was found to contain six fishes. The head waters of the Smoky Hill and Big Horn rivers abound in this aquatic *Eutania radix*.

EUTÆNIA MACROSTEMMA Kennicott.

Eutania macrostemma KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 331.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 41.

Eutania insigniarum COPE, Proc. Amer. Phil. Soc., 1884, p. 172.

Tropidonotus ordinatus var. *macrostemma* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 212.

Scales in twenty-one rows, all keeled except inferior row, which sometimes presents short keels at the bases of the scales. Superior labials eight, eye over fourth and fifth. Three postoculars. Temporals 1-2. Lateral band on the third and fourth rows of scales. Dorsal band wanting or only distinct on the removal of the epidermis. Sometimes the dorsal region yellower than the sides for a width of from four to six scales. A row of black spots above the lateral stripe, which are sometimes divided so as to form two rows, one above the other. A row of incomplete black spots below the lateral line, which are formed by the adjacent black edges of three or four scales. A black spot on each side behind the angle of the mouth, which extends upward to near the occipital shields and is preceded by a light spot of half crescentic form. The last superior labial and temporals in front of this space have black edges. Superior labials slightly black-edged. Gastrosteges, one hundred and sixty-four; urosteges, sixty-eight to seventy-four.

Measurements.—Total length of a rather small specimen, 435 mm.; of tail, 96 mm.; to canthus oris, 14 mm.

There are two well-marked subspecies of the *E. macrostemma*, which differ as follows:

Larger and darker colored, spots and bands indistinct, paired spots on parietal plates generally absent	<i>E. m. macrostemma</i> Kennicott.
Smaller and brighter colored; ground, stripes, labials, and belly yellow; labials black-bordered; parietal spots present	<i>E. m. flavilabris</i> Cope.

EUTÆNIA MACROSTEMMA MACROSTEMMA Kennicott.

E. insigniarum COPE, Proc. Amer. Phil. Soc., 1884, p. 172.

This species has been found in Arizona, whence two specimens were sent to the Zoological Garden at Philadelphia. They are of plain brownish colors, and resemble at first sight the *E. sirtalis sirtalis*. Previous to this discovery of its range, the subspecies was chiefly

known from the valley of Mexico. I took three specimens at the lake of Xochimilco and at Chapultepec, and Dr. Dugès sent me a fourth from Guanajuato. Mr. Bocourt sent a fifth from some part of Mexico to the National Museum. These all differ from the type of *E. macrostemma*, which is also from the valley of Mexico, in the general indistinctness of their markings and in the absence of the parietal spots. On loss of the epidermis the markings come out, except the parietal spots.

This is a water snake in its habits, but spends much of its time on the banks. My friend, Mr. Julius Flohr, of the City of Mexico, took me on a boating excursion on the lake of Xochimilco, near that city,

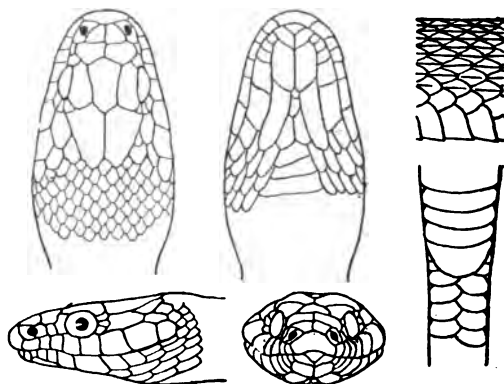


Fig. 280.

EUTANIA MACROSTEMMA MACROSTEMMA KENNICOTT.

— 1.

Valley of Mexico.

Cat. No. 7947, U.S.N.M.

and I had the opportunity of observing the habits of this snake and of comparing them with those of the *E. melanogaster*, which inhabits the same locality. On being disturbed, the *E. macrostemma* plunges into the water, but does not go far beneath the surface, but takes refuge under the edge of the bank, or emerges in a new spot, so that it is not difficult of capture. When approached or caught it is very pugnacious. The habits of the *E. melano-*

gaster are different. It, too, lies on the bank, but when it plunges it dives to the bottom and so effectually conceals itself that it can not be captured on that occasion. When caught it is much less pugnacious than the *E. macrostemma*. The columns that support the aqueduct that carries water from Chapultepec to the City of Mexico are covered with a dense vegetation, which is continuously watered by leaks in the venerable structure. On examining this vegetation at my height above the ground, I encountered in the thick of it a round eye. Exposure revealed first the head and then the body of a snake of this species, which found a congenial abode in that position.

This is the species which appears on the arms of Mexico. Tradition states that Cortes adopted the arms after observing an eagle (*Polyborus*) seize a water snake and carry it to a large cactus (*Opuntia*) in its talons.¹

I have seen this brightly colored form from Guanajuato (Dugès); Mexico (Hoeje), and Vera Cruz (Sartorius and the Geographical Commission).

¹ *Eutania flavilabris* Cope, Proc. Acad. Nat. Sci. Phila., 1866, p. 306; Proc. Amer. Phil. Soc., 1884, p. 173.

EUTÆNIA BUTLERII Cope.

Eutænia butlerii COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 399.

Tropidonotus ordinatus var. *butlerii* BOULENGER, Cat. Snakes Brit. Mus., I, p. 212.

Scales in nineteen longitudinal rows, the inferior much the widest and keeled. Superior labials seven, inferior labials eight. Temporals, 1-1; the second large, extending from parietal to labials. Oculars, 1-3. Parietals with the external border abruptly contracted. Gastrosteges, one hundred and forty-four; anal, one; urosteges, sixty-two. Head very little distinct, muzzle conical, a little protuberant; eye not large. Ground color above, olive brown, which is marked by the usual three longitudinal yellowish

bands. The median covers one and two half rows of scales, and the lateral covers the second, third, and fourth rows. Both are black bordered on both edges, the border of the latter band interrupted. The segments of the superior border of the lateral

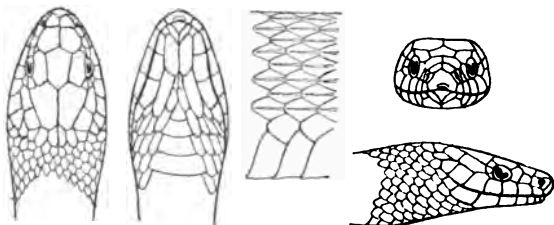


Fig. 281.

EUTÆNIA BUTLERII COPE.

= 1.

Cedar Creek, Waterloo, Indiana.

Cat. No. 21698, U.S.N.M.

band represent the inferior spots of the lateral series; the superior row is wanting from the scales. Gastrosteges and urosteges olive, yellowish in front, dark behind, with a vertical black spot at the anterior border of each end of each of the gastrosteges. Labial scuta without black borders; head olive above, without markings, except two small, yellow, black-edged parietal spots in the usual position.

I have seen but two specimens of this species, one of which belongs to the collection of Purdue University, at Lafayette, Indiana (Cat. No. 264), and which is labeled as from Richmond, Indiana. It is remarkably distinct from everything which occurs in the United States, and has only superficial resemblances to the *E. macrostemma* Kennicott of Mexico. Its peculiar characters are the great width of the lateral color band, which covers three rows of scales, one more than in any other species; the black borders of the bands; the absence of well-defined dorsal lateral spots, and the absence of markings on the head and labial scuta. Besides these color marks, the presence of a large second temporal plate extending to the labials is peculiar to this species, and the small number of inferior labials distinguishes it from the *E. sirtalis* group; and the narrow conical head is characteristic. In the *E. macrostemma* the general appearance is somewhat similar, but the labial plates are broadly black edged, and the lateral band covers but two rows of scales; there is a large postoral yellow dark-edged crescent, and the second temporal plate is smaller and does not reach the labials.

A second specimen, received from northern Indiana, shows that the species ranges over the entire State. It only differs from the type in rather darker colors.

This handsome species is dedicated to Mr. A. W. Butler, of Brookville, Indiana, who lent me the type specimen for examination, and whose interest and labor in the natural sciences have resulted in many interesting discoveries.

Eutania butlerii Cope.¹

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
21692	1	Cedar Creek, Waterloo, Indiana.	P. H. Kirsch	Alcoholic.

Mr. G. Reddick reports² that the Indiana University summer school took a single specimen of this species at Turkey Lake, Kosciusko County, Indiana. He says:

It is 14½ inches long. It is short and chubby, and its movement is very characteristic of it. It does not have the gliding movement of *E. saurita*, nor the swift and active movement of the *Natrix sipedon*, but seems rather to exert a large amount of force to do little crawling. The movement is so characteristic that I believe any one having once seen the peculiar way in which it tries to hurry itself away would ever after be able to recognize it at a distance.

EUTÆNIA BISCUTATA Cope.

Eutania biscutata COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 21.

Of this species I have only two specimens, which agree in the following characters: They differ in the number of rows of scales, however, one having twenty-three and the other having twenty-two. All the rows of scales keeled, the median ones very strongly. Labials eight, the eye resting on the fourth and fifth. Two preoculars; three postoculars. The muzzle is rather short, the frontal plate exceeding in length the region anterior to it and equaling the common suture of the parietal scuta. Nasals rather short; loreal as long as high; inferior preocular nearly square; superior preocular not reaching frontal. Superior labials all truncate above and none of them elevated, the sixth touching the inferior postorbital. Temporals, 1-2-3; the anterior are rather large. Pairs of genieals subequal. Gastrosteges, one hundred

¹The *Eutania rutiloris* (Cope, Proc. Amer. Phil. Soc., 1885, p. 388) which is compared with the *E. butlerii* in the analytical table of species, is from Cozumel Island, Yucatan.

It resembles in coloration and in the keeled first row of scales the *E. sackeni* of Florida. It differs in the shorter tail, which is one-third the length in the *E. sackeni*, in the eight superior labials, and in the generally stouter proportions, as well as in the red lips.

This species was taken by the naturalists of the U. S. Fish Commission steamer *Albatross* on Cozumel Island, off the east coast of Yucatan.

²Proc. Indiana Acad. Sci., 1895, p. 261.

and fifty-six; urosteges, seventy-nine. In the specimen with twenty-three rows of scales, the length of the tail enters the total four and two-sevenths times; in the one with twenty-one rows, it enters four and one-tenth times.

Color everywhere black, except on the chin and throat and on the inferior side of the tail. The former was reddish in life. There are very faint traces of stripes on the second, third, and fourth, and on the median dorsal rows of scales. Marks of the lateral stripe are more evident on the fourth than on the second rows of scales. No traces of spots on the parietal scuta.

This species is allied to the *E. elegans*, from which it differs in its two preocular plates, in the position of the lateral stripes, and, supposing the individuals to be adult, in its small size. The color is different from that of any of the forms referred to that species.

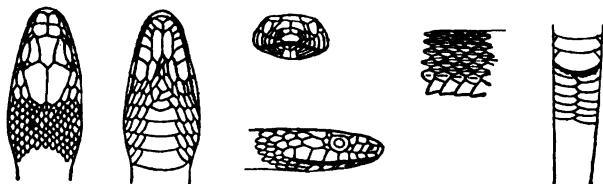


Fig. 282.

EUTANIA BISCUTATA COPE.

× 1.12.

Klamath Lake, Oregon.

Collection of E. D. Cope.

I took the specimens described on the shores of Klamath Lake, Oregon. Their sluggish movements contrasted strongly with those of the more active *E. sirtalis parietalis*, which is abundant at the same locality.

EUTANIA ELEGANS Baird and Girard.

Eutania elegans COPE, Check-list N. Amer. Batr. Rept., 1875, p. 41.

Eutania elegans BAIRD and GIRARD, Cat. Rept. N. Amer., Pt. 1, Serpents, 1853, p. 34.

Eutania vagrans BAIRD and GIRARD, Cat. Rept. N. Amer., Pt. 1, Serpents, 1853, p. 35.

Eutania marciana BAIRD and GIRARD, Cat. Rept. N. Amer., Pt. 1, Serpents, 1853, p. 36.

Eutania hammondi KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 332.

Eutania couchii KENNICOTT, Rept. U. S. Pac. R. R. Survey, Williamson's Rept., X, 1857, p. 10.

Tropidonotus trivittatus HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1853, p. 257.

Tropidonotus vagrans BOULENGER, part, Cat. Snakes Brit. Mus., I, 1893, p. 202.

Form moderately robust, the length of the tail entering the total from three and three-quarters to four and two-fifths times. Head quite distinct, muzzle moderately elongate; eye of medium size. Scales in twenty-one longitudinal rows, the inferior as deep as long, very faintly keeled, and not notched. Scales of other rows keeled, the second a little deeper than the rest, the apices feebly or not notched. Superior labials eight, fourth and fifth bounding eye, those posterior to the orbit deeper than long. Loreal deep as or deeper than long; oculars, 1-3; temporals, 1-2-3.

The color is variable, but a more or less distinct lateral stripe is present in all except the melanistic forms, on the second and third rows of scales. In all except the melanistic forms there is one row of lateral square spots above the lateral stripe, and in most there are two rows of spots. There are no well-defined markings on the abdominal scuta.

The labial and scale formulæ in this species are quite constant. In two specimens of the *E. e. plutonia* the labials are eight, and the scales in twenty-one rows. In two of *E. e. elegans* the figures are the same. In one of *E. e. brunnea* the figures are the same. In eight of the *E. e. lineolata* the figures are the same. In four of the *E. e. hammondii* the figures are the same except in one individual, where there are but nineteen rows of scales. In twenty-two specimens of *E. e. vagrans* there are twenty-one rows of scales in all, and in five specimens there are seven superior labials on one side. In one only are there seven superior labials on both sides. In all the others there are eight labials on both sides. In twelve specimens of *E. e. marciiana* all have eight upper labials, and all but two twenty-one rows of scales. In the two the scales are in nineteen rows. Thus in fifty-one specimens there are three departures from the regular scale formula, and one entire departure and five partial departures from the labial formula.

There are seven well-marked color forms of this species, which mostly occupy distinct geographical regions, and are abundantly entitled to be called subspecies. It is indeed possible that some of them might be as well regarded as species, but the existence of transitions and the lack of importance in the characters themselves induce me to consider them as subspecies. They are, however, in the great majority of cases easily recognized. The characters of these forms are as follows:

I. No spots; labials not dark bordered.

Black above and below; no lateral band; dorsal band wanting or a trace in front only..... *E. e. plutonia*.

Black above, light below; three distinct stripes, all black bordered.. *E. e. elegans*.

Brown above, light below; three distinct stripes, not black bordered. *E. e. brunnea*.

II. Spotted; labials not dark bordered; nuchal spots indistinct.

Stripes and spots distinct; the superior row of spots confluent into a band; the inferior separated by chestnut-red spaces; belly olivaceous. *E. e. ordinoides*.

Spots large anteriorly, small or confluent posteriorly; interspaces indicated by pale edges of the scales; bands present, distinct..... *E. e. lineolata*.

Spots small, 80-100; interspaces large, pale; bands present, often indistinct; belly with dark middle..... *E. e. vagrans*.

III. Spotted; labials dark bordered; nuchal spots more or less distinct.

No dorsal band; lateral band indistinct; intermediate space lead colored, with one row of spots next to the lateral band; yellow marks behind eye incomplete; spots, 74-90..... *E. e. conchii*.

Dorsal and lateral bands indistinct; three rows of spots, light ground on each side, 50-60 in each row; two yellow crescents extending upward at angle of mouth and behind eye..... *E. e. marciiana*.

Of these subspecies the *E. e. plutonia* has been found rarely and at remote localities, and the *E. e. brunnea* is only known from one specimen, so that these can not be yet regarded as geographical forms. The

E. e. elegans has been found so far in northern and central California only. The *E. e. lineolata* is from the same region and from Oregon and Washington as well. The *E. e. vagrans* is characteristic of the entire region between the Sierra Nevada on the west and the eastern border of the Great Plains on the east, and belongs to higher parts of the Rocky Mountain ranges as well as to the valleys between them. The *E. e. hammondii* is characteristic of southern California and southern Arizona and New Mexico. The *E. e. marciana* belongs to the valley of the Rio Grande and adjacent regions in Texas and Mexico. It is seen from the above that the *Eutænia elegans* inhabits all of the Nearctic realm excepting the eastern region.

As regards transitions between the subspecies, they will be mentioned under their respective heads. I refer now to the number of the spots in each dorsal row which they present. In *E. e. vagrans* this extends from eighty-four to one hundred and three in six specimens in which I counted them. In *E. e. marciana* they range from fifty-two to fifty-eight in four specimens, while there are seventy-three in an otherwise typical specimen. We have here a considerable interval between the ranges. This is filled up by the *E. e. couchii*, where they run from seventy-four to ninety-one in five specimens. The number of spots is then tolerably constant, but insufficient to enable us to define species.

I have endeavored to ascertain whether there is any constancy in the number of temporal scales in them. Thus, in the typical form, *E. e. elegans*, there are three rows of scales bordering the postorbital superior labials above, while in the *E. e. lineolata* there are as often four as three. In one of the latter (Cat. No. 10848) there are, however, but three rows. In the *E. e. vagrans* five specimens have four rows and five have three rows. In the *E. e. hammondii* three have three rows and one (Cat. No. 866) has four. In the specimens of *E. e. marciana*, seven have three, and three have four. The rows always have the formula 1-2-3-4.

EUTÆNIA ELEGANS PLUTONIA Cope.

Eutænia elegans plutonia COPE, Proc. U. S. Nat. Mus., XIV, 1832, p. 653.

Eutænia vagrans angustirostris YARROW, Wheeler's U. S. Expl. W. 100th Mer., Zoology, V, p. 554, pl. xx, figs. 2, 2a.

Tropidonotus vagrans BOULENGER, part, Cat. Brit. Mus., I, 1893, p. 202.

In the type of this subspecies (Cat. No. 10912) there is a very faint trace of dorsal and lateral bands. The gular region is lead colored, or a little lighter than the rest of the lower surfaces. The end of the tail is injured, so that its exact length can not be ascertained, but it does not appear to differ from that of the other forms. Gastrosteges 162; temporals 1-2-3. Black of belly uniform.

In the second specimen (Cat. No. 8171) there is a dorsal band on the anterior 2 inches of the length, and traces in light scale borders for about one-third the total length. For the same distance light scale borders similarly indicate the position of the lateral stripe. Similar less distinct

light scale borders indicate faintly the outlines of an inferior row of lateral spots for about half the length. The belly is lead colored, with

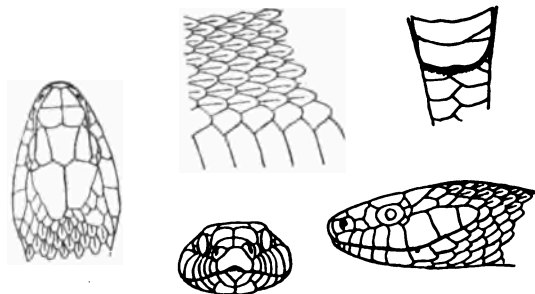


Fig. 283.

EUTÆNIA ELEGANS PLUTONIA COPE.

= 1.

Arizona.

Cat. No. 8171, U.S.N.M.

irregular black blotches in the center of the gastrosteges, as in *E. e. vagrans*. These are wanting in front. Head black, except the rostral, nasal, internasal, and anterior parts of the fourth, fifth, sixth, and seventh superior lateral plates, which are brown, perhaps red in life. The marginal half of the inferior labials black; gular region brown and lead colored in the mid-

dle. Extremities of gastrosteges black. Scuta, 163-146; end of tail possibly a little shortened.

This specimen shows indications of the color pattern of the *E. e. vagrans*. It has no specific affinity with the *E. angustirostris*.

Eutænia elegans plutonia Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
10912	1	Fort Walla Walla, Wash- ington.	Capt. C. Bendire	Alcoholic.
8171	1	Arizona	F. Bischoff.....	do.

EUTÆNIA ELEGANS ELEGANS Baird and Girard.

Eutænia elegans COPE, Check-list N. Amer. Batr. Rept., 1875, p. 41.

Eutainia elegans BAIRD and GIRARD, Cat. Rept. N. Amer., Pt. 1, Serpents, 1853, p. 34.

Tropidonotus trivittatus HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1853, p. 257.

Head short, broad. Upper labial plates higher than long. Eyes small. Exterior dorsal row of scales largest, delicately carinated, remainder of equal size. Above deep blackish brown. An ochraceous or dark gamboge-yellow dorsal stripe begins at the occiput, and suddenly widening to the width of three or four scales, contracts gradually to one and two half-rows, at which it continues to the tail. On each side is a well-defined stripe of greenish yellow along the second and part of the third outer row, and contrasting decidedly in color with the vertebral line. The blackish brown color is strongly defined between the stripes, below them the greenish white sides and abdomen are tinged with brown (on the exterior dorsal and ends of abdominal

scutellæ). The bases of the scales on the exterior dorsal row are black, which sometimes shows when the scales are separated, though usually covered by the incumbent edges. Superior labials with only traces of black borders at the upper posterior angles of the middle three or five.

This subspecies is readily distinguished from its nearest analogue, *E. e. lineolata*, by the darker color of the sides, the better-defined dorsal and lateral stripes, smaller head, smaller number of temporal scales, etc. It has a strong resemblance to *E. proxima* in distribution of color, but is stouter and shorter, and has the lateral stripe on the second and third rows, not on the third and fourth.

But two specimens of this form have come under my observation. In the type (Cat. No.

882) the end of the tail is not certainly complete, but it is so in the second (Cat. No. 878). In the latter the tail enters the total length three and three-quarters times. In both the temporals are 1-2-3; the lowest of the third row, at the distal end of the last superior labial.

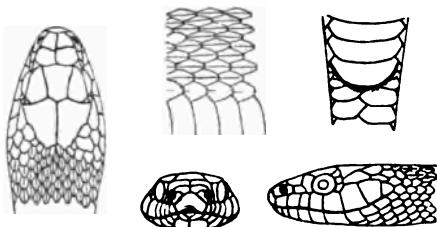


Fig. 284.

EUTÆNIA ELEGANS ELEGANS BAIRD AND GIRARD.

— 1.

El Dorado County, California.

Cat. No. 872, U.S.N.M.

Cat. Nos.

Gastrosteges. Urosteges.

882	167.	57.
878	166.	88.

Eutænia elegans elegans Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
882	1	Eldorado County, California	Dr. C. C. Boyle	Alcoholic.
878	1	Redding, California	H. W. Henshaw	do.
18708	1	Yosemite Valley, California.	Nelson	do.
18709-10	2	10 miles south of Mount Whitney, California.	Dutcher	do.

EUTÆNIA ELEGANS BRUNNEA Cope.

Eutænia elegans brunnea COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 654.

Color of the superior surfaces to the third row of scales (exclusive), brown; of lower surfaces, light yellow, extending to the third row of scales (inclusive). Dorsal stripe, light yellow, occupying the median row of scales and the adjacent borders of the adjacent rows, but not well defined laterally, and not black borders. It covers three full rows on the nape, and only one row behind the middle of the length, and is wanting on the tail. No traces of nuchal spots. Labials colored like the abdomen, the superior with traces of brown posterior borders. There is but a faint brown shade on the first row of scales and the ends

of the gastrosteges, scarcely defining the lateral stripe below. Belly unspotted.

In the type, Cat. No. 10849, the head is short, wide. Temporals 1-2-3 and 1-3-3. Gastrosteges, one hundred and seventy-two; anal, one; urosteges, seventy-seven. Genaes equal, short. Tail entering total length four and one-tenth times.

This is a much more robust form than the *E. e. elegans*, and brown takes the place of black in the coloration. In the indefinite dorsal stripe it resembles the *E. e. lineolata*, but it does not show the least trace of the square spots, even when the epidermis is removed.

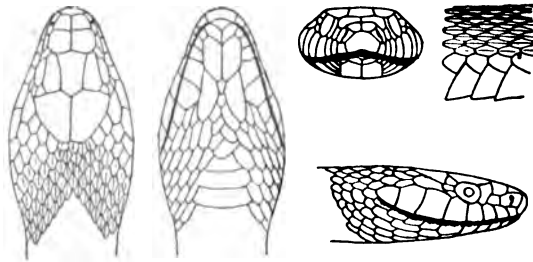


Fig. 285.

EUTANIA ELEGANS BRUNNEA COPE.

= 1.

Fort Bidwell, California.

Cat. No. 10849, U.S.N.M.

Eutania elegans brunnea Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
10849	1	Fort Bidwell, California....	H. W. Henshaw	Alcoholic.
10850	1	do	do	do.

EUTANIA ELEGANS LINEOLATA Cope.

Eutania elegans lineolata COPE, Proc. U. S. Nat. Mus., XV, 1892, p. 655.

Color above, brown to the third row of scales, exclusive; below, light olive, unspotted. A longitudinal dorsal stripe and a lateral stripe on the second and third rows of scales, light yellow; first row of scales light brown. Integument between the stripes marked with two rows of blackish square spots, which are, however, nearly invisible when the skin is not stretched, but are indicated by short whitish borders of the scales, which occupy thin interspaces. These spots are rarely distinguishable posteriorly, but become smaller and closer together, and then disappear. They are more distinct in the young, as in other forms, and when countable behind, range from seventy-five to ninety in number. The brown of the sides extends to the head without forming nuchal spots, and passes from dark to lighter brown

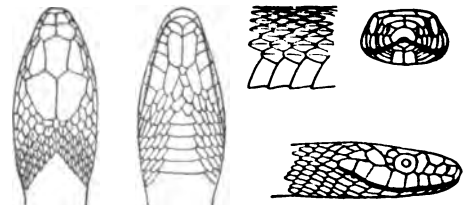


Fig. 286.

EUTANIA ELEGANS LINEOLATA COPE.

= 1.

East California.

Cat. No. 9565, U.S.N.M.

on the frontal region, or continues, especially in younger specimens, to the end of the muzzle. Inferior labials yellowish olive, the middle ones with a trace of a dark posterior border above. A pair of parietal spots; gular region light yellow. Dorsal stripe faint on tail.

Temporals 1-2-3, or, in some specimens, 1-2-3-4. Tail three and four-fifths times in total length. Gastrosteges one hundred and eight; anal, one; urosteges, eighty-nine.

This is a common form of eastern California and Oregon. It extends as far south as Fresno, California (Cat. No. 12564), and east as far as Walla Walla, Washington (Cat. No. 10911). It connects completely the subspecies *E. e. elegans* and *E. e. vagrans* in spite of their very different appearance. A specimen (Cat. No. 11805) from Shasta County, California, is almost as uniformly black as the former, while Cat. No. 10911, from Walla Walla, approaches quite near to the *E. e. vagrans* in the dark lead-colored middle abdomen.

Eutænia elegans lineolata Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8579	2	Lake Tahoe, Nevada.....	Sept. —, 1876	Dr. W. A. Hammond, U. S. A.	Alcoholic.
8580	1	Southern California	— —, 1875	do.....	do.
8587	1	do	Aug. —, 1875	do.....	Alcoholic type.
9565	1	East California	do.....	do.....	Alcoholic.
10840	1	Fort Klamath, Oregon	Aug. 29, 1878	do.....	do.
10843	1	Oregon	Sept. —, 1878	do.....	do.
10844	1	do	Sept. —, 1878	do.....	do.
10845	1	Camp Warner, Oregon	Aug. 10, 1878	do.....	do.
10846	1	do	do.....	do.....	do.
10847	1	Camp Bidwell, California	July —, 1878	do.....	do.
10848	1	do	July —, 1878	do.....	do.
10849	1	do	July —, 1878	do.....	do.
10850	1	do	July —, 1878	do.....	do.
12564	1	Fresno, California	do.....	Gustav Eisen	do.
10811	1	Southern Oregon	do.....	H. W. Henshaw	do.
10911	3	Walla Walla, Washington	do.....	C. Bendire	do.
11805	1	Baird, Shasta County, California	do.....	L. Stone.....	do.

EUTÆNIA ELEGANS VAGRANS Baird and Girard.

Eutænia vagrans BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 35.—YARROW, Wheeler's Rept., U. S. Geog. Survey, W. of 100th Mer., V, p. 548.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 41.

Tropidonotus vagrans BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 202.

General color, clay color, tinged with brownish above and olivaceous below. Stripes very indistinct; covering but one row of scales for most of the length, but covering three rows on the nape. No distinctly darker shade below the lateral stripe. Gastrosteges with black blotches at the middle, narrowing more or less toward their margins, and frequently wanting on the anterior part of the length. Lips with or without faint traces of black posterior borders on the middle superior labial shields. Two rows of lateral black spots are indistinctly indicated when the integument is not stretched, by some black specks at the bases

of every other row of scales along the median and lateral stripes. On stretching the skin, these marks are seen to be parts of narrow brown crossbars, a superior row alternating with an inferior row, each occupying about a scale in width. The number of these bars is generally greater than in any other subspecies or species, ranging up to 103, but sometimes they are as few as 84, thus equaling some of the specimens of *E. couchii*. The ground color is alike between all of them. There is in adults a blackish cordiform mark on the nape, which represents the nuchal spot in the *E. e. couchii*, etc., and the top of the head is like the back, brownish clay color.

In the specimen which has served as my type (Cat. No. 8731) the tail enters the total length four and one-third times. Gastrosteges, one hundred and fifty-eight; urosteges, seventy-four; anal, one.

In young specimens the dorsal spots are more distinct, but never so large and distinct as in the *E. e. lineolata*. The top of the head is darker, and there are distinct nuchal spots, thus approaching the *E. e. couchii*. There is considerable difference in the distinctness of the spots in adults. Thus, Cat. No. 8727 (Taos, New Mexico), and Cat. No. 5497 (Fort Bridger, Wyoming) the spots are well marked as in *E. e. marciana*, but those below the lateral stripe are not so distinct, being represented by traces only. In Cat. No. 926 the

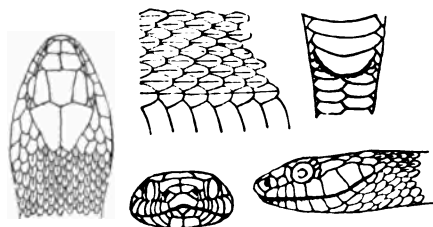


Fig. 287.

EUTANIA ELEGANS VAGRANS BAIRD AND GIRARD.
= 1.

Camp 12, Nevada.

Cat. No. 11725, U.S.N.M.

top of the head and nape are black, and the labials are bordered with the same. The specimen is small. On the other hand, in Cat. No. 3498, no spots appear on the scales, and their existence is only discoverable by stretching the skin.

Measurements of sixteen specimens show the proportions of the tail to the total length. Cat. No. 906, three and four-fifths times; Cat. No. 8730, four and one-third; Cat. No. 8735 (2), four and one-fifth and three and four-fifths; Cat. No. 11725, three and four-fifths; Cat. No. 9514 (3), four and four and two-fifths; Cat. No. 5351 (2), four and four and one-fourth; Cat. No. 926, four and one-tenth; Cat. No. 8720, four and two-fifths; Cat. No. 8723, four and one-fifth; Cat. No. 5226, four; Cat. No. 7237, three and two-thirds; Cat. No. 8728, three and two-thirds.

This form inhabits the central regions of North America, including the three topographical divisions—the Great Plains, the Colorado Basin, and the Nevada Basin. It is not known from the Sonoran region, and occurs doubtfully in the Western, but reaches it at Walla Walla, Washington. A specimen (Cat. No. 901) of this form is said to come from Humboldt Bay, California, but this locality may be held under advise-

ment for further information. An undoubted specimen (Cat. No. 7239) is marked as coming from Steilacoom, Washington, which is well within the Pacific region.

Eutania elegans vagrans Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
921	1	Near 38° latitude		Lieut. E. G. Beckwith, U. S. A.	Alcoholic.
8128	1	Pymont, Nevada	— —, 1872	Dr. H. C. Yarrow	do.
8142	2	Snake Valley, Nevada	— —, 1872	do.	do.
933	1	Arispe		Dr. F. H. Webb	do.
8731	1	Taos, New Mexico	Aug. —, 1874	Dr. H. C. Yarrow	do.
3498	2	San Francisco Mountains New Mexico.			do.
8733	1	Taos, New Mexico	Aug. —, 1874	Dr. H. C. Yarrow	do.
8720	1	do	Aug. —, 1874	do.	do.
8727	2	do	Aug. —, 1874	do.	do.
8421	1	(?)	Aug. —, 1874	Dr. O. Loew	do.
8728	2	Abiquiu, New Mexico	Aug. —, 1874	do.	do.
8721	1	San Ildefonso, New Mexico.	Aug. —, 1874	do.	do.
8722	1	do	Aug. —, 1874	do.	do.
8712	1	Wilton Spring, New Mexico.	June —, 1873	Dr. C. G. Newberry	do.
8420	1	San Juan River, New Mexico.		Lieut. R. Birnie, U. S. A.	Head, alcoholic.
916	3	Salt Lake to California		S. G. Bereman	Alcoholic.
7239	1	Fort Steilacoom, Washington.			do.
907	1	Humboldt River			do.
926	1	Gold Mountains		H. B. Mollhausen	do.
915	1	Fort Benton, Missouri			do.
5351	2	Upper Missouri		Captain Reynolds, U. S. A.	do.
905	2	Cache la Poudre River		Lieut. F. T. Bryan, U. S. A.	do.
906	1	North Platte		W. T. Wood	do.
7794	1	Fort Laramie, Wyoming		Dr. J. G. Cooper	do.
7237	1	Medicine Bow, Wyoming		Lieut. F. T. Bryan, U. S. A.	do.
903	1	Dallas, Oregon		Dr. George Suckley, U. S. A.	do.
8064	3	Fort Whipple, Arizona		E. Palmer	do.
8717	1	Mineral Spring, Arizona	Aug. —, 1873	Dr. C. G. Newberry	do.
8711	1	San Luis Valley, Colorado	Sept. —, 1873	Dr. J. T. Rothrock	do.
8745	2	Conejos, Colorado		A. Barnes	do.
8723	1	Twin Lakes, Colorado	Aug. —, 1873	Dr. J. T. Rothrock	do.
8713	1	Pagosa, Colorado	Sept. —, 1874	C. E. Aiken	do.
8730	1	Twin Lakes, Colorado	Aug. —, 1873	Dr. J. T. Rothrock	do.
908	1	California		Dr. William Gambel	do.
9505	1	Montana		Dr. E. Coues, U. S. A.	do.
10915	2	Fort Walla Walla, Washington.		Capt. Charles Bendire, U. S. A.	Alcoholic (jun.).
9514	5	Montana		Dr. E. Coues, U. S. A.	Alcoholic.
901	1	Humboldt Bay, California		Lieut. W. P. Trowbridge, U. S. A.	do.
8419	1	Pagosa, Colorado	Sept. 7 1874	A Barnes	do.
8171	1	Arizona	— —, 1871	Exploration west of one hundredth meridian.	do.
11539		Southern Oregon	July —, 1878	H. W. Henshaw	
11725	1	Camp 12, Nevada	July —, 1867	Robert Ridgway	do.
8064	1	Fort Whipple, Arizona			do.
5226	1	Camp Burgwyn, New Mexico.		Capt. R. Anderson, U. S. A.	do.
5497	1	Fort Bridger, Utah		C. Drexler	do.
4648	1	West Bridger		U. S. Exploring Expedition.	do.
5351	1	Nebraska		Lieutenant Reynolds, U. S. A.	do.
8543	1	(?)		Dr. H. C. Yarrow	do.
7239	1	Fort Steilacoom, Washington.		Dr. George Suckley, U. S. A.	do.

Eutania elegans vagrans Baird and Girard—Continued.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When collected.	From whom received.
			Feet		
18690		Silver Creek, Nevada.....		Nov. 8, 1890	Bailey.
18700		Ash Meadows, Nevada.....		Mar. 3, 1891	Palmer.
18701		do.....		Mar. 4, 1891	do.
18702		North Fork, Kern River, California.....		Sept. 12, 1891	do.
18703	Young.	do.....	7,000	Sept. 10, 1891	Nelson.
18704	Young.	Soda Springs, North Fork, Kern River, California.....		Aug. 15, 1891	Bailey.
18705		Whitney Creek, California.....	8,500	Sept. 5, 1891	do
18706		Owen's River, California.....	6,000	July 20, 1891	Nelson.
18707		Lone Pine, California.....		June 11, 1891	Palmer.

Catalogue No.	Locality.	From whom received.
16764-5	Fort Wingate, New Mexico.....	Dr. R. W. Shufeldt.
17565	Swan River, near Swan Lake, Montana.....	U. S. Fish Commission.
17568	do.....	do.
17569-71	McClellan County, near Helena, Montana.....	do.
21271	Sheridan, Wyoming.....	do.
21356	Custer, South Dakota.....	do.
21408	Sand Point, Idaho.....	do.
22392-3	Vancouver Island, British Columbia.....	John Macoun.
22397-9	do.....	do.
22401-2	do.....	do.
22405	British Columbia.....	do.

EUTÆNIA ELEGANS COUCHII Kennicott.

Eutania couchii KENNICOTT, Report U. S. Pac. R. R. Survs., X, Williamson's Rept., 1857, p. 10.

Eutania hammondi KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 332.

Tropidonotus ordinatus var. *couchii* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 210.

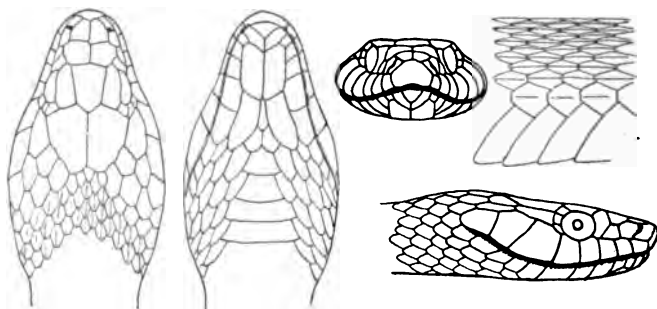


Fig. 288.

EUTANIA ELEGANS COUCHII KENNICOTT.

= 1.

Fort Tejon, California.

Cat. No. 5496, U.S.N.M.

Twenty-one rows of scales. Form rather slender; head long, snout elongate and narrow, but rather obtuse. Postorbitals three, the upper much the largest. Eight upper labials, sixth largest; its postero-inferior angle much elongated. No dorsal stripe; lateral stripe olive yellow on the second and third rows. Back uniform dark olive brown or blackish, without distinct spots. Abdomen whitish olive, lighter anteriorly, and a dark line along the middle posteriorly.

Form rather slender, the tail about one-fourth the total length. Head very narrow and much elongated; the snout very narrow, but rather obtuse. The back above the third row of scales is dark uniform brownish lead-color without band, except a light olivaceous yellow; first row of scales a little darker, and similar to the abdomen, being of a very dull whitish olive. Bases of the scales of the first row black, forming a row of from 74 to 80 small spots; bases of abdominal scutes the same, the color broader toward their extremities, and generally concealed by the incumbent scute. A narrow slate-colored line along the middle of the abdomen posteriorly. Head above, dark olive; superior labials very light olive yellow, margined with black posteriorly, excepting the eighth. This is black anteriorly, its posterior end being occupied by a yellowish patch which is confluent with the yellow of the neck. Lower postorbitals yellow. Two small yellow occipital dots and a small yellow dot on each side of the posterior part of the vertical plate; these sometimes absent.

Young specimens, and older ones, after the removal of the epidermis, exhibit faint indications of a very narrow dorsal stripe upon a single row of scales, but in one there is no trace of this, even upon the neck, where it is usually visible. These specimens also exhibit traces of two series of large alternating spots, which present somewhat the appearance of a zigzag line. In a young specimen there is a distinct series of spots on the first dorsal row, each spot covering one scale, and separated from those adjacent by two scales. Only one specimen is without the dark line upon the abdomen posteriorly. There are no irregular black blotches upon the abdomen as in *E. angustirostris*. In Cat. No. 11775 the small lateral spots are ninety-one in number, thus equaling that seen in the *E. e. vagrans*.

The length of the tail varies within limits. Thus in Cat. No. 52196 it enters the length four and one-tenth times; in Cat. No. 8584, four and three-fifth times, and in Cat. No. 8745, four and two-third times.

Adults of this subspecies are generally easily recognized. Small specimens approach corresponding ones of the *E. e. vagrans*, since they agree in the dark colored upper surface of the head, nuchal spots, and labial borders. An adult (Cat. No. 866) from the Pitt River, California, resembles an adult *E. e. vagrans* more than usual, but has no dorsal stripe except on the anterior frontal of the length. The nuchal spots are distinct, and the labials are blackish bordered, but the gastrosteges have black blotches at their middles and bases, as is not the case in the other specimens of *E. e. couchii*. In this individual the muzzle is elongate and more compressed than usual, resembling that of the *E. multimaculata*. There are also four rows of temporals. This individual represents a local race, and its habitat is out of the usual range of the species. It is the one from which the description of the *E. couchii* was drawn by Kennicott.

The range of this subspecies is Southern California and Arizona.

Eutania elegans couchii Kennicott.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
885	1	Fort Tejon, California.....		Governor Stevens.....	Alcoholic.
894	1	San Diego, California.....		Dr. W. A. Hammond, U. S. A.....	do.
7793	1	do.....		Dr. J. G. Cooper.....	do.
8604	2	Mohave Desert, Arizona.....	July —, 1875	Dr. O. Loew.....	do.
8586	1	Southern California.....	Aug. —, 1875	H. W. Henshaw.....	Heads, al- coholic.
5496	2	Fort Tejon, California.....		J. Xantus.....	Alcoholic.
866	1	Pitt River, California.....			do.
8584	1	Mohave Desert, California.....		Dr. O. Loew.....	do.
9253	1	(?).....		(?).....	do.
11775	1	Fresno, California.....		G. Eisen.....	do.

U. S. N. M. No.	Age and sex.	Locality.	Altitude.	When collected.	From whom received.
			Feet.		
18687	Female adult	Owens Valley, Alvord, California.....	4,000	1891. June 27	Stephens.
18688	Adult.....	Owens Valley, fish slough, 10 miles north of Bishop, California.....		July 2	do.
18689	Female adult.	Owens Lake, Cartago, California.....	3,700	June 10	do.
18690		Old Fort Tejon, California.....		July 3	Palmer.
18691	Young.....	Lone Pine, California.....		Aug. 21	Fisher.
18692	Young.....	Kern River, 25 miles above Kernville, California.....		July 9	do.
18693	Young.....	do.....		July 5	do.
18694	Young.....	Kern River, South Fork, California.....		July 7	do.
18695	Adult.....	Kern River, California.....	7,200	Sept. 8	Nelson.
18696		Kern River, South Fork, California.....	2,700	June 22	Palmer.
18697	Adult.....	Soda Springs, Kern River, California.....		Sept. 4	Fisher.
18698	Young.....	do.....		Aug. 14	Bailey.

Catalogue No.	Locality.	From whom received.
16356-7	San Diego County, California.....	C. R. Orcutt.
16345	San Diego (west of mountains), California.....	do.
16346	Orcutt, San Diego County, California.....	do.
16347-8	Lake on Laguna Mountain, San Diego County, California.....	do.
16349	Near Orcutt, San Diego County, California.....	do.
20208-9	Witch Creek, Santa Ysabel, San Diego County, California.....	H. W. Henshaw.

This form is generally easily recognizable in adults by the absence of the vertebral stripe. But Van Denburgh describes a specimen from Lower California, in which the dorsal stripe is present.

EUTÆNIA ELEGANS MARCIANA Baird and Girard.

Eutania marciانا COPE, Check-list N. Amer. Batr. Rept., 1875, p. 41.

Eutania marciانا BAIRD and GIRARD, Cat. Rept. N. Amer., Pt. 1, Serpents, 1853, p. 36.

Tropidonotus ordinatus var. *marciannus* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 210.

Above, a light-yellowish brown, with a vertebral paler line and one lateral on each side, more or less indistinct. Three series of square black spots on each side, of about 56-60 in each series, from occiput to anus. Sides of head black, with a crescentic patch of yellowish posterior to the labial plates. Three and sometimes four black vittæ radiating from the eye across the jaws. A double white spot with a black margin on the suture of occipital plates.

The markings about the head are generally very constant and distinct. Viewed laterally, we see first the large dark-brown patch at the back part of the head, extending as far back as the posterior extremity of the jawbones. In the anterior part of this patch is seen the crescentic patch (concave before) of yellowish white, with a more or less narrow dark-brown margin anteriorly. The next black band starts from the posterior edge of the superciliaries, and passes obliquely downward and backward along the posterior edge of the sixth upper labial. Similar black margins are seen on the posterior edges of the fifth and fourth labials, the intervening spaces being yellowish white, particularly on the fifth upper labial. Occasionally the posterior margins of the seventh and third labials have the black line as well as those mentioned, which frequently extend across to the posterior margins of the corresponding lower labials. The white spot on the anterior portion of the occipital suture is always margined with black.

The six series of black spots are arranged so as to alternate with each other. The lower or third series on each side is below the indistinct lateral stripe.

The posterior edges of each abdominal scutella shows a black margined spot on each side. The dorsal line is generally a single scale in width, occasionally including portions of the lateral, and itself sometimes encroached upon by the black spots. Each spot is about a scale or a scale and a half long and about three scales broad. The number in the dorsal series from the head to the anus varies from fifty-six to sixty, but in Cat. No. 860 they number seventy-three. Posterior edges of scales very slightly emarginate, if at all. All are decidedly keeled.

Baird and Girard give the following as the numbers of abdominal scuta and scutellæ and the dimensions in inches:

	Gastrosteges.	Urosteges.	Scales.	Length.	Tail.	Spots.
Red River, Arkansas	152.	75.	21.	34.	8.	56.
New Braunfels, Texas	153.	75.	21.	16.	4½.	60.
Do	153.	73.	21.	21½.	5½.	60.
Do	149.	61.	21.	16¾.	3½.	56.
Do	152.	71.	21.	10¾.	2¾.	54.
Near San Antonio	163.	53.	21.	20½.	3½.	58.
Do	160.	85.	21.	27¾.	6½.	56.
San Pedro	156.	78.	21.	12¾.	3½.	56.
Do	153.	70.	21.	14½.	3¾.	56.
Indianola	145.	66.	21.	11½.	2½.	57.

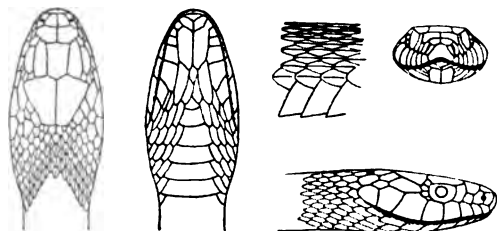


Fig. 289.

EUTÆNIA ELEGANS MARCIANA BAIRD AND GIRARD.

= 1.

Sonora, Mexico.

Cat. No. 7235, U.S.N.M.

The tail measures into the total length as follows: Cat. No. 844 (type), four and one-tenth times; Cat. No. 7235, four and three-fifths; Cat. No. 404, four; Cat. No. 5351, four; Cat. No. 8416, four and two-fifths; Cat. No. 1418, four and one-fourth.

As in *E. e. vagrans*, the top of the head is black in young specimens. In very large specimens an approximation to the *E. e. vagrans* is seen the paling of the dorsal spots by the restriction of the black color to the skin and its disappearance from the scales. The spots below the lateral lines become especially indistinct, and this is important, since these are one of the distinguishing features of the species (Cat. Nos. 8416, 8417). The head markings retain their bright contrast of colors, so that the subspecies is always easily distinguished.

The range of this species is rather restricted, being confined to the Rio Grande Valley and a limited region on each side of it to its mouth. In Texas it extends as far east as San Antonio.

Eutania elegans marciana Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
844	1	Red River, Arkansas		Capt. R. B. Marey, U. S. A.	Alcoholic type.
8744	1	San Ildefonso, New Mexico.	Aug. —, 1874	Cope and Yarrow	Alcoholic.
8745	1	do	Aug. —, 1874	Cope, Yarrow and Shedd	do.
8746	1	do	— —, 1874	Dr. H. C. Yarrow	do.
849	1	Charco Escondido, Mexico.		Lieut. Couch, U. S. A.	do.
8417	1	San Ildefonso, New Mexico.	Aug. —, 1874	Dr. H. C. Yarrow	do.
1369	1	Brownsville, Texas		Capt. S. Van Vliet, U. S. A.	do.
1417	1	Indianola, Texas		Col. J. D. Graham, U. S. A.	do.
1418	1	Eagle Pass, Texas		A. Schott	do.
851	1	Point Isabella, Texas		G. Wurdemann	do.
5351	2	Near 32d parallel		Lieut. Reynolds, U. S. A.	do.
852	2	Fort Yuma, California	— —, 1855	Maj. G. H. Thomas, U. S. A.	do.
742	1	Near San Antonio, Texas		Dr. C. B. R. Kennerly	do.
860	1	Rentersville, Texas		Prof. Forschey	do.
7235	1	Sonora, Mexico		Maj. W. H. Emory, U. S. A.	do.
8416	1	San Ildefonso, New Mexico.	— —, 1874	Dr. H. C. Yarrow	do.
10713	1	San Antonio, Texas	June —, 1879	C. W. Schuermann	do.
10727	1	!		Dr. Geo. B. Sennett	do.
404	1	!		!	do.
405	1	!		!	do.
5491	1	Matamoras, Mexico		Lieutenant Couch	do.
15344		Matamoras		Dr. D. W. Prentiss	do.
15664		San Diego, Texas		William Taylor	do.
17048-57		Cameron County, Texas		C. K. Worthen	do.
17442		Tucson, Arizona		Herbert Brown	do.
17557		do		do	do.
22329		Quinlan Creek, Kerrville, Texas.		Hy. Caudlin	do.

EUTANIA ELEGANS ORDINOIDES Baird and Girard.

Eutania ordinoides BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 33.

Tropidonotus ordinoides BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, p. 176.

This form is quite different from any of those enumerated as subspecies of *E. elegans*, but it resembles considerably the *E. sirtalis parietalis*. The distribution of colors is quite the same as in that form, but the red between the lateral spots is of a chestnut color, and not

crimson, as in *E. s. parietalis*. The agreement of the scale and labial formulæ with those of the *E. elegans* induces me to refer it to that species rather than to the *E. sirtalis*, although the latter exhibits occasionally in California eight upper labials.

Besides the characters mentioned, this form has a yellow dorsal stripe which is well defined, covering one and two half rows of scales. The lateral stripe is defined below by a brown shade, which fades into the brownish olive of the belly below. The spots of the inferior lateral row are large and are confluent above with the wide black dorso lateral band. No nuchal spots, but the dark color of the back continues into the brown of the top of the head. Superior labials brownish olive; the posterior narrow by brown bordered; chin and throat yellow. Gastrosteges unspotted, 156 in number. Tail injured; the base with a triangular section. Length of body, 490 mm. One specimen from San Francisco, California. Baird and Girard enumerate their specimens all from California, and two of them from San Francisco.

Eutania elegans ordinoides Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
	1	San Francisco, California...	Collins Overland Telegraph Co.	Alcoholic.

EUTÆNIA ANGUSTIROSTRIS Kennicott.

Eutania angustirostris KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 332.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 41.

Body moderately stout; tail less than one-fourth the total length and very small. Head exceedingly elongated and narrow, more so than any other of the genus; snout very long, narrow, and pointed. Crown plane above; eye large. Upper labials eight, sixth largest, seventh scarcely smaller. Dorsal rows twenty-one; outer row large, very faintly carinated; the second smaller but broader than the third; the next rather large and elongated, and strongly carinated. Dorsal stripe narrow, very indistinct. An indistinct, dull, whitish lateral stripe on the second and third rows. Above the lateral stripes dark olive-brown or black. Abdomen dark ashy olive or black.

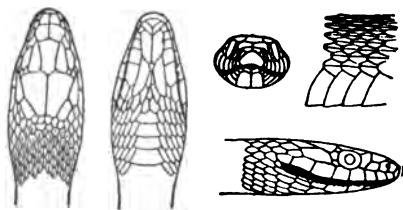


Fig. 290.

EUTÆNIA ANGUSTIROSTRIS KENNICOTT.

= 1.

Parras, Coahuila, Mexico.

Cat. No. 959, U.S.N.M.

The back above the third row of scales is dark brown without spots, but with each scale bordered with darker. The scales of the second and third row are grayish olive, with distinct yellow borders. The first

and abdomen are ashy olive, with irregular heavy black blotches upon the latter, more numerous along the middle third, but offering no indication of a narrow black line as in *E. elegans couchii*. On the first three rows some scattered scales have black spots on their bases and edges. Head above dark olive; upper labials light olive with vertical edgings.

A young specimen is entirely black; the dorsal stripe obsolete, being indicated only by a faint line on a single row of scales; the lateral stripes very indistinct; the first and part of the second row of scales entirely black. A whitish line along each side of the abdomen formed by a white spot at the end of each scute. These are also margined posteriorly with the same color. Throat whitish.

The remarkable elongation of the snout will distinguish this species from any others at present known, excepting *E. multimaculata*, from which it differs in other respects. The snout is more elongated, and decidedly more pointed than in *E. e. couchii* or *E. leptcephala*; the head is not at all depressed anteriorly as in *E. leptcephala*, and the eye is strikingly larger. The colors of the back and abdomen are darker, and the rows of scales are twenty-one, not nineteen. As compared with *E. e. couchii*, which it most nearly resembles, beside the difference in the form of the snout, the head is depressed posteriorly (not anteriorly); hence the crown is quite plane throughout, while in *E. e. couchii* the crown is somewhat arched, this form being more observable upon the occipital and frontal region. In *E. angustirostris* the general form is stouter, while the head is longer, and hence a greater elongation of the frontal and parietal plates. The scales of the upper rows are also larger and more elongated, and more strongly carinate. The tail is stouter, being considerably less than one-fourth the total length, while in *E. e. couchii* it is fully or more than one-fourth. This member is also very slender, the body tapering abruptly near the anus in the former species. The dorsal stripe, though narrow, is not wanting, and the abdomen is much darker, being ashy olive, with heavy black blotches throughout, instead of light yellow or grayish olive, and there is no indication of the central line. The young specimen is strikingly different from the young of *E. e. couchii*.

Temporals 1-2-3 on one side and 1-3-4 on the other. The tail is longer than in *E. elegans*, entering the total length three and one-fourth times.

But one specimen has been thus far obtained. The elongate muzzle, narrow labial plates, and longer tail distinguish it from the allied species. The coloration is also quite peculiar, and may be characteristic, as the specimen is small.

Eutania angustirostris Kennicott.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
959	1	Parras, Coahuila, Mexico	Lieutenant Couch, U. S. A.	Alcoholic.

As the locality from which the type was brought is not far from the United States and Mexican boundary, I retain it in the present work.

EUTÆNIA EQUES Reuss.

Coluber eques REUSS, Mus. Senckenb., I, 1834, p. 152, pl. VIII, fig. 2.

Eutænia cyrtopsis KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 333.—COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 306; Wheeler's Rept. U. S. Surv. W. 100th Mer., V, 1875, p. 546; Bull. U. S. Nat. Mus., No. 17, 1880, p. 23; Proc. U. S. Nat. Mus., XIV, 1892, p. 656.

Thamnophis cyrtopsis var. *cyclides* COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 299. *Tropidonotus collaris* JAN, Arch. Zool. Anat. Phys., III, 1865, p. 209; Icon. Gén., 1867, Pt. 25, pl. v, fig. 2.

Eutænia cyrtopsis ocellata COPE, Bull. U. S. Nat. Mus., No. 17, 1880, p. 22.

Tropidonotus virens var. *collaris* GARMAN, N. Amer. Rept., 1883, p. 25.

Eutænia collaris COPE, Proc. Amer. Phil. Soc., XXII, 1884, p. 173.—DUGÈS, La Nature (2), I, 1888, p. 127, pl. XIII, fig. 16.

Tropidonotus ordinatus D. var. *eques* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 209.

Head wide, very distinct; body slender. Scales in nineteen rows, rather narrow; the first as deep as long, weakly keeled; the second intermediate in form between the first and third; remainder rather narrow, not emarginate. Superior labials eight. Loreal as high as long; oculars 1-3. Temporals in type 1-3-3; in a second specimen from the same region 1-2-3 on one side, and 1-2-4 on the other. Tail varying in length according to the subspecies. Frontal plate not wider than the superciliaries. Eyes large, muzzle short.

Ground color above, light reddish brown; below, pale green. Three longitudinal stripes above, the median narrow more or less of its length on one row of scales, the lateral on the second and third row of scales. Two rows of black spots occupy the space between the stripes. These spots generally combine into a single row of large spots on the anterior part of the body, but do not in one specimen (Cat. No. 8067, the type). They also frequently join at their angles, forming a zigzag black band. A row of large jet-black spots below the lateral stripe alternates with the spots of the inferior row. Belly immaculate.

This well marked species has the slenderness of body, and in one form the length of tail, of the *Eutænia proxima*, but it has a head and scales of the *E. elegans* type. It is characterized by the narrowness of the dorsal stripe, together with the huge black nuchal spots.

It is represented by four subspecies, which differ as follows:

I. Dorsal stripe on three rows of scales on anterior half of body.

Stripes yellow, not black bordered. No conspicuous spots below lateral stripe.
E. e. aurata.

II. Dorsal stripes on one row of scales only.

α Tail about one-third the total length. No large spots below lateral stripe.

Dorsal stripe on one row of scales. *E. e. eques.*

αα Tail between one fourth and one-fifth the length.

Large spots below lateral stripe alternating with lower lateral spots, and invading lateral stripe *E. e. collaris.*

No large spots below lateral stripe; stripes yellow, dorsal on three rows.

E. e. aurata.

EUTÆNIA EQUES EQUES Reuss.

Eutænia cyrtopsis KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 333.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 41.

Form very slender, but little stouter than that of *E. saurita*, but with shorter tail, one-fourth the total length. Head large. Eye very large. Superior labials eight, sixth and seventh largest. Three post-orbitals, upper much the largest. Scales in nineteen rows. Color above olive brown, appearance of a zigzag line. Dorsal stripe whitish, narrow, distinct to the tip of the tail. Lateral stripe on the second and third rows of the same color, broad, distinct from head to anus. A series of black spots on the first dorsal row; abdomen uniform greenish white. Orbitals whitish; occipital spots obsolete.

This species somewhat resembles *E. marciana* in the pattern of coloration, which, however, has the lateral stripe upon the third row only,

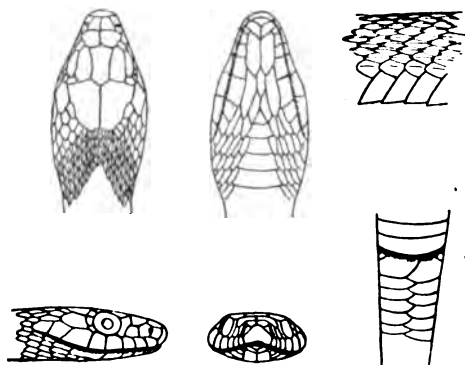


Fig. 291.

EUTÆNIA EQUES EQUES REUSS.

= 1.

Durango, Mexico.

Cat. No. 8069, U.S.N.M.

instead of the third and second. The difference in form is most striking, the body being almost as slender as in *E. saurita*. The scales are rather larger than in *E. marciana*, and those of the first row more elongated. The ground color above the lateral stripe is olive brown. The first dorsal row is whitish olive or greenish white. The abdomen is uniform greenish white, except a small black marginal spot near the extremity of each abdominal scute. The whitish dorsal row occupies one, and less

than two half rows of scales, and is encroached upon by the black dorsal blotches, which sometimes reach the central row. The lateral stripe is also encroached upon by the spots above and below it, though never entirely interrupted by them near the head, as in *E. marciana*. The head is dark olive above; labials margined vertically with black, somewhat as in *E. marciana*, except the seventh plate, which in the former is heavily bordered with black on both edges; in the latter slightly upon the anterior edge alone. There is a vertical light patch at the angle of the mouth crossing the posterior upper labial, and confluent with the white of the neck and not distinct and crescent-shaped, as in *E. marciana*. Behind the occipital plates is a very large double black blotch. Behind this there are three or four perfect square blotches extending quite from the dorsal to the lateral stripe, each three scales in length, and separated by intervals of about two scales wide. Behind these the general pattern of spots is seen. It consists of two

series of large, oblong, rhomboidal, alternating spots, each about four scales long, and somewhat confluent with each other at the adjacent corners, giving the appearance of a zigzag line upon each side. On the first and second dorsal rows is a third series of very distinct black spots, each on parts of three scales, and the extremities of two abdominal scutes. The intervening spaces of greenish white ground color are equal in width to the spots.

Cat. Nos.	Locality.	Gastrosteges.	Urosteges.	Scales.	Length. Inches.	Tail. Inches.
930	Rinconada, Coahuila, Mexico.....	174.	90.	19.	24 $\frac{1}{2}$.	6.
8062	Durango, Mexico	163.		--	(?)	

Other specimens have the dorsal stripe on a single row of scales and the lateral stripe has its upper border regular and distinct, without interruption from the middle series of spots, the lower edge as in the specimen above described. Instead of the distinct spots upon the first and second rows in that specimen, they are here broken up into black borders of three approximated scales. In the only large specimen of this variety the keels of the first dorsal row are not parallel to those of the rows above, being directed obliquely downward and backward, so that the posterior end of one keel falls below the anterior end of the next succeeding, instead of forming a continuous line. The nose of this specimen is also more pointed than in the typical one.

The lengths of the tails in this subspecies are as follows: Cat. No. 8067 (2) three and one-half and three and one-twelfth times in total length; Cat. No. 5023, three and one-fifth times.

Eutania eques eques Reuss.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
8062	2	Durango, Mexico.....	Lieutenant Couch	Alcoholic.
5023	1	Cape St. Lucas, Lower California.	John Xantus	do.
17794-5		Fort Huachuca, Arizona ...	Wilcox	do.

EUTANIA EQUES COLLARIS Jan.

Eutania collaris JAN, Icon. Gén. Ophid., Pt. 25, 1867, pl. v, fig. 2.

Eutania cyrtopsis ocellata COPE, Bull. U. S. Nat. Mus., No. 17, 1880, p. 22.

Scales in nineteen longitudinal rows, the inferior smooth anteriorly, but keeled posteriorly. Eight superior labials; loreal higher than long; temporals 1-2-3, the anterior large. The lateral band on the second and third rows of scales cream-colored; dorsal band extending to the end of the tail, orange red. The usual alternating square black spots between the two bands; the scales in the light interspaces black or deep brown. Anteriorly the lateral black spots unite into a single series of subquadrate spots. The lower borders of the lower series of spots invade the lateral band, sometimes cutting it entirely off into sections of regular length. Below the middle of each section, and therefore alternating with the inferior lateral spots, is another black spot,

relating to the arched light bar above it, as pupil to eyebrow. The superior lateral spots in like manner invade the median dorsal band, either cutting it off entirely or giving it a laterally undulatory course. Its width is alternately one and one and a half rows of scales. A dark-

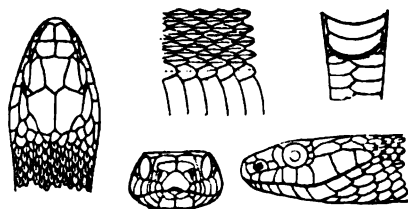


Fig. 292.

EUTANIA EQUUS COLLARIS JAN

= 1.

Helotes, Texas.

Cat. No. 10528, U.S.N.M.

gray shade connects the lateral inferior spots. Inferior surfaces olive-lead colored; the gastros- teges with blackish bases at the extremities. A large black spot behind the occipital plates, extend- ing to below the angles of the mouth, which is deeply notched behind by the dorsal band. No occipital spots. Labial plates yel- low, all equally black-edged. No yellow crescents on the side of the head or neck.

Measurements.—Total length, 600 mm.; length of rictus oris, 20 mm.; of tail, 135 mm. Lengths of tail, Cat. No. 10528 (2), four and two thirds, four and one-sixth; Cat. No. 10201, four; Cat. No. 8746, four and one-sixth; two collections E. D. Cope, from Helotes, Texas, four and one-half, four and three-fifths. Scuta, 167–172.

Eutania equus collaris Jan.

Catalogue No.	Number of speci- mens.	Locality.	From whom received.	Nature of specimen.
10528	2	Helotes, Texas	G. W. Marnock	Alcoholic.
10201	1	White River Canyon, Ari- zona.	Dr. R. T. Burr	do.
8716	1	San Ildefonso, New Mexico.	Dr. H. C. Yarrow	do.
22387	1	San Antonio, Texas	H. H. and C. S. Brimley	do.

EUTANIA EQUUS AURATA Cope.

Eutania aurata COPE, Proc. U. S. Nat. Mus., XIV, 1891, p. 659.

Form of medium robustness; head well distinguished; tail four and two-fifths times in total length. Scales in nineteen series, those of the inferior row as deep as long, smooth, or feebly keeled; the transverse diameter of the scales diminishing gradually and nowhere so small as in *E. e. equus* and species of the *E. saurita* series. Superior labials eight, all deeper than long. Loreal deeper than long; oculars, 1-3. Temporals, 1-2-3. Frontal wider than superciliaries, not reaching pre-ocular; parietals rather short and wide. Scuta, 108-174.

Brown, without spots, and with three longitudinal yellow stripes, the lateral distinct, and running on the second and third rows of scales. Belly yellow, immaculate. Labials yellow, all with a black posterior border except the last; the penultimate with the yellow reduced to an oval spot on the anterior inferior portion. A large black nuchal spot on each side of the narrow median yellow stripe.

The brown of the body is uniform, and the three longitudinal stripes

are without black borders. The dorsal stripe occupies the middle and parts of two adjacent rows of scales on the anterior half of the length, and one row on the posterior half, and is continued to the end of the tail. The lateral stripe covers two entire rows of scales except on the posterior half, where it occupies the second row only. It is bordered below by a band of a rather lighter brown than that of the space above it, on the first row of scales, and on the angles of the gastrosteges which enter between the separate scales of the latter. Every other scale of the first row has a black speck at its upper and lower base. Belly immaculate yellow, except a black shade at the base of the extremity of a few of the scuta, which is only visible on stretching the latter apart.

This handsome form resembles the *Eutania elegans brunnea* in general form and appearance, but the latter has no nuchal spots nor black labial borders nor band beneath the lateral stripe. It belongs to a

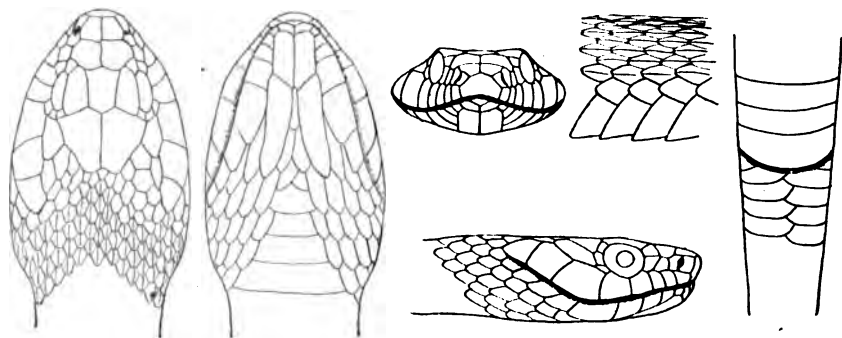


Fig. 203

EUTANIA EQUESTRIS AURATA COPE.

= 1.

Type.

Lake Valley, New Mexico.

Collection of E. D. Cope.

different section of the genus. Its nuchal spots and labial borders are like those of the *Eutania e. equestris*, but it is not a slender-bodied species, and the scales are wider than in that form, representing a different type in the genus.

I have seen but one specimen of this species, which I obtained near Lake Valley, in southern New Mexico. There is no specimen in the United States National Museum.

EUTANIA INFERNALIS Blainville.

Eutania infernalis COLE, Proc. U. S. Nat. Mus., XIV, 1892, p. 657.

Coluber infernalis BLAINVILLE, Nouv. Ann. Mus. Hist. Nat., Paris, IV, 1835, p. 59, pl. xxvi, fig. 3.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 26.

Tropidonotus ordinatus var. *infernalis* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 207.

This species occupies a position intermediate between the *E. elegans* and the *E. sirtalis*, having the labial plates of the former and the scale

formula of the latter. In color pattern it differs from all the subspecies of either, and, as its tail is generally longer than either, it is necessary to admit it as a separate species. It is more than usually compressed at the anal region, where the scales are wide and more irregular than is observed in other species. In the form *vidua* this compression extends to the entire body. There are two well-marked subspecies, as follows:

Color blackish, with traces of an inferior row of spots and a distinct lateral stripe; belly yellowish olive, with black center; throat and lips yellow *E. i. infernalis*.
Uniform black, with yellow dorsal stripe only *E. i. vidua*.

The geographical range of this species includes middle and southern California only, so far as yet known.

EUTÆNIA INFERNALIS INFERNALIS Blainville.

Eutainia infernalis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 26.

Coluber infernalis BLAINVILLE, Nouv. Ann. Mus. Hist. Nat., Paris, IV, 1835, p. 59, pl. xxvi, fig. 3. *

Head moderately distinct, muzzle medium. Parietal plates not shortened, narrowed posteriorly. Scales not narrowed, graduating in width

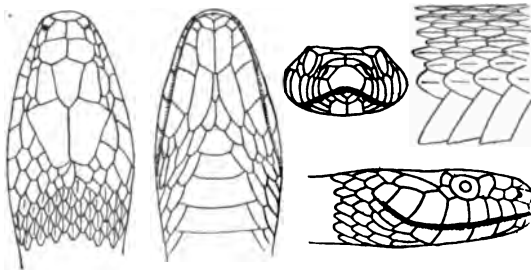


Fig. 294.

EUTÆNIA INFERNALIS INFERNALIS BLAINVILLE.

= 1.

Cat. No. 16654, U.S.N.M.

from the first row, which is smooth. Gasterosteges one hundred and fifty-eight, urosteges seventy, anal one.

Color above blackish brown, with a median yellow stripe which covers the middle and parts of adjacent rows to the base of the tail, where it contracts to one row and continues to the end.

Belly from yellow to

olivaceous, extending to the third row of scales inclusive, with or without a shade on the first row distinguishing a lateral stripe, immaculate. Scales from fourth to eighth rows, inclusive, with the keels olivaceous or yellowish, forming delicate longitudinal lines. Shades of the same color are so distributed on the scales as to give the appearance of indistinct spots in two rows, an appearance which is increased by a few scattered yellowish dots on the margins of some of the scales. This appearance represents actual spots in young specimens. In some of the large specimens this appearance is lost, nothing but the few yellow specks remaining. Labial plates yellow or olive, with or without very narrow posterior black borders. Throat and chin always yellow.

This subspecies resembles the *Eutænia elegans lineolata*, but it has always (sixteen specimens) one row of scales less on each side. The

spots are far less distinct, the dorsal stripe is wide and better defined, and the colors are much brighter. In six specimens from San Francisco the spots are distinct in adults, as in the type of Baird and Girard.

Eutænia infernalis infernalis Blainville. .

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
11754	11	Fresno, California	G. Eisen	Alcoholic.
	6	San Francisco, California ...	Collins Overland Telegraph Co.	do.
16654	1	do	do	do.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When collected.	From whom received.	Remarks.
18711	Adult.	San Joaquin River, High Sierra, California.	Feet. 8,100	July 29	Nelson....	Near Mammoth Pass.
18712	.....	Monterey, California .....	.....	Oct. 5	Bailey	
18713	.....	Morro, San Luis Obispo County, California.	.....	Nov. 10	Nelson	
18714	.....	.....do .....	.....	.....do ..	do	

EUTÆNIA INFERNALIS VIDUA Cope.

Eutænia infernalis vidua COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 658.

Body moderately robust, compressed to the base of the tail; head moderately distinct; muzzle moderately elongate. Tail from three and two-thirds to three and three-fourths times in total length, compressed for the basal half. Scales in nineteen rows graduating in size from the first on each side, which is as deep as wide and very feebly keeled. Other scales not very elongate, feebly notched. Superior labials eight, all higher than long. Loreal not longer than high; oculars 1-3; temporals 1-2-3; one of the second row larger than the rest. Geniæ narrow, subequal. Frontal short, twice as wide as the superciliaries anteriorly. Scuta, 151-1-77.

Color black, without markings excepting a yellow olivaceous throat and chin and a yellow dorsal stripe which covers one and two half-rows of scales from the parietal plates to the basal third of the tail, whence it runs on a single row to the end of the latter. Muzzle and labial plates uniform lead color; throat yellowish.

This species is so far known from the two original specimens only, which are in excellent preservation. It resembles in general characters

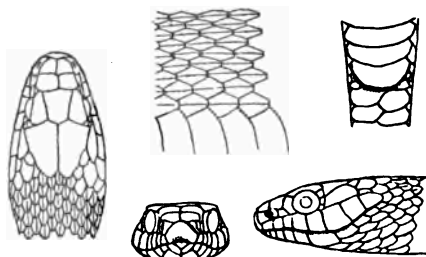


Fig. 285.

EUTÆNIA INFERNALIS VIDUA COPE.

= 1.

San Francisco, California.

Cat. No. 970, U.S.N.M.

the species of the *E. sirtalis* group, but is quite different from any of the forms which I have included in that protean species. The tail is longer, as I find out of ninety-seven specimens of the latter which I have measured but five have the tail as long as in the specimen of *E. vidua* with the shortest tail and none with so long a tail as the other. The eight superior labials distinguishes it from all but four specimens of the ninety-seven, and in some of these the additional labial is an intercalation. Two of the four specimens come from the same locality, namely, San Francisco. The compressed body is seen in a few specimens of the *E. sirtalis pickeringii*, also from the Pacific region, but not in any other forms. In some of these the stripes disappear, but all together, and not the lateral only, leaving a well-developed dorsal. The coloration is a curious parallel of the "*vidua*" form of the *E. leptocephala*, which it closely resembles. The superior labials of the latter are different in being lighter and with black borders, and the throat is whitish and the muzzle brown.

While this form has these points of connection with certain extremes of variation of the *E. sirtalis*, it agrees with none of them, and may be regarded as a species until more definite points of connection are found.

Eutania infernalis ridua Cope.

Catalogue No.	Number of specimens.	Locality.	Nature of specimen.
970	2	San Francisco, California	Alcoholic.

The above two specimens in the U. S. National Museum are the only ones that I have seen. Both are from San Francisco, California.

EUTÆNIA BRACHYSTOMA Cope.

Eutania brachystoma COPE, American Naturalist, 1892, p. 964, fig.—BOULENGER, Cat. Snakes Brit. Mus., I, p. 418 (*E. leptocephala*).

But one specimen of this species has yet been obtained. It is small, but not young, and it belongs to the group of which *E. sirtalis* and *E. leptocephala* are members. It resembles both these species, but differs in important particulars. The labial plates are six above and eight below, instead of seven above and ten below. The head is not distinct from the neck, resembling in this respect the *Tropidoclonium lineatum*. The parietal scuta are convex in outline and not contracted posteriorly. The head plates are otherwise as in those species, including oculars 1-3, temporals 1-2; and postgenaeals longer than pregenaeals. Scales in nineteen series, all keeled except the inferior row, which has a trace of a keel. Gastroteges, one hundred and thirty-two; anal, one; urosteges, seventy-two.

Color below and upper lip light olive, unspotted; above darker olive, with a broad, brown band on each side, which extends from the fourth

to the middle of the ninth row, inclusive, leaving a pale dorsal stripe of ground color one and two half scales wide. Chin and anal plate yellowish. No parietal pair of spots visible to the eye, but traces appear under a magnifier.

Measurements.—Total length, 286 mm.; tail, 71 mm.

The reduction of the number of labial plates is not effected by the fusion of the fifth and sixth of the *E. sirtalis*, as I at first suggested, since the abbreviation of the plate, which, though longer than those adjacent to it, does not equal the two plates in the *E. sirtalis*, and the sutures of the last two labials in no wise correspond with those of the other species. The normality of the structure is confirmed by the reduction of the inferior labial series by two scales, all of which are of perfectly normal form. The gastrosteges are fewer in number than in any *E. sirtalis* or *E. leptocephala* known to me, while the number of urosteges remains as in those species. The inferior scale of the second row of temporals is almost obliterated on one side. The absence of spots on the gastrosteges distinguishes it from most of the subspecies of *E. sirtalis*. The general form is that of *Tropidoclonium*, and the distinctness of the two nasal plates is the only external feature which separates it from that genus. It is one of the forms—of which several are now known—which, while retaining the general features of the water snakes, have adopted a terrestrial life and more or less burrowing habits.

Dr. Boulenger, in commenting on this species, supposes it to be a *E. leptocephala*, questioning the correctness of the locality. There is, however, no mistake as to this latter point. It has a superior labial less and twelve gastrosteges less than the smallest number I have met with in that species.

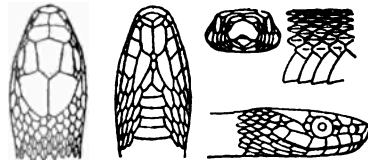


Fig. 296.

EUTANIA BRACHYSTOMA COPE.

= 1.

Type.

Franklin, Venango County, Pennsylvania.

Collection of E. D. Cope.

Eutania brachystoma Cope.

Number of specimens.	Locality.	From whom received.
1	Franklin, Venango County, Pennsylvania	Miss A. M. Brown.

The typical specimen is preserved in my private collection.

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EUTÆNIA LEPTOCEPHALA Baird and Girard.

Eutænia leptocephala BAIRD and GIRARD, Cat. N. Amer. Reptiles, Pt. 1, Serpents, 1853, p. 29.—COPE, in Yarrow's Reptilia, Rept. U. S. Geog. Surveys W. of 100th Mer., V, p. 550; Proc. Acad. Nat. Sci. Phila., 1883, p. 23.

Eutænia cooperii KENNICOTT, U. S. Pac. R. R. Surveys, XII, Pt. 2, p. 296.—COPE, in Yarrow's Reptilia, Rept. U. S. Geog. Surveys W. of 100th Mer., V, p. 551.

Eutænia atrata KENNICOTT, Rept. U. S. Pac. R. R. Surveys, XII, 1859, p. 296.

Head little or not distinct from the body; the latter rather robust; the tail short, and between one-fourth and one-fifth the total length.

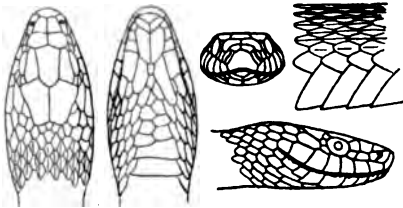


Fig. 297.

EUTÆNIA LEPTOCEPHALA BAIRD and GIRARD.

— 1.

Cat. No. 961, U.S.N.M.

Scales in seventeen or nineteen longitudinal rows, the inferior smooth or fully keeled, as deep as or deeper than long, the others of graduated widths to the narrow middle rows. Eye rather small; oculars 2 (1-3); loreal not larger than high. Frontal not wide, but twice as wide as the superciliaries in front, not reaching preocular. None of the superior labials longer than high, seven in number, with

a tendency to the fusion of the third and fourth or fourth and fifth, or all three. Preocular and loreal region grooved. Temporals, 1-2-3. Scuta and measurements (in inches) according to Baird and Girard.

	Gastrosteges.	Urosteges.	Length.	Tail.
Puget Sound, Oregon	146.	59.	16.	3 1/2.
Do.....	149.	66.	23 1/4.	5.
Do.....	144.	63.	17 1/4.	4 1/2.
Do.....	148.	(†)	20.	4.

Measurements.—Type: Total length, 590 mm; of tail, 128 mm.

Color varying from light reddish brown to black, with dorsal and lateral stripes present or absent. When the lateral spots are present they are small, are ranged along the borders of the stripes, or their positions, and are not in contact with each other. Belly varying from black to olive with blackish shades on the bases or more of the gastrosteges, and without definite spots on the extremities of the latter.

This variable species may be distinguished from *E. sirtalis*, its nearest ally, by the narrow, scarcely distinct head, more strongly grooved preocular region; the small size of the dorsal spots when present, and the absence of spots on the ends of the gastrosteges. There are, however, some specimens in which the head is of much the shape of that of the *E. sirtalis*, and some of the latter (*E. s. graminea*) have no spots on the ends of the gastrosteges. The majority of the specimens of the *E. leptocephala* differ further in the presence of two preocular scales, and about half of the specimens have but seventeen rows of scales. On specimens of the latter kind the *E. cooperii* and *E. atrata* were established. Of twenty-six specimens examined, twelve have the scales

in seventeen rows, and fourteen in nineteen rows. In some of those with nineteen rows the additional row extends but a short distance on each side, so that for all but a small part of the length there are seventeen rows. In thirteen individuals there is but one preocular on each side; in two there are one on one side and two on the other, and in eleven individuals there are two on each side. Two preoculars prevail in the spotted types, for of eight of these but three have a single preocular. Five of the black and well-striped specimens have two preoculars on both sides, and two have two on one side and one on the other, while all of the uniform colored specimens, whether light or dark, have but one preocular on both sides. The grooving of the preocular region is generally, but not invariably, present. In several specimens the second or third rows of temporals are represented by a single plate, appropriately to the small size of the head.

The color varieties are as follows: Brown, with blackish spots, moderately distinct stripes (eleven specimens); black, with the dorsal and generally the lateral stripe well defined (eight specimens); black, with stripes and spots very indistinct (five specimens); black with dorsal stripe only (*E. atrata*) (one specimen); uniform brownish or olive (three specimens).

These forms have no distinct geographical range, examples of all of them coming from Puget Sound. As a whole, the species belongs to the Pacific coast, not south of San Francisco. How far east it ranges is not known, but I have never seen it from central Oregon or Washington. One specimen (Cat. No. 5208) in the U. S. National Museum collection is marked as coming from the "Rocky Mountains."

An interesting series of eight specimens was obtained by Mr. S. N. Rhoads—five from Tacoma and three from Victoria, British Columbia. He did not obtain it from any locality east of the latter point. In my paper on the "Characters and variations of the snakes of North America,"¹ I state that of the specimens in the U. S. National Museum rather less than half have two preocular plates, and one-half have seventeen and the other half nineteen rows of scales. Of the eight specimens brought by Mr. Rhoads, six have two and two have three preoculars, one of the latter coming from Tacoma and one from Victoria; six have seventeen rows of scales and two have nineteen, both the latter from Tacoma. The distinctive characters of the species are thus confirmed. The ground color in two of the Tacoma specimens is black and the others brown. All of the Victoria specimens are brown, and two of them have a red dorsal stripe.

¹Proc. U. S. Nat. Mus., XIV, 1892, p. 660.

Eutania leptcephala Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
593	3	Puget Sound, Oregon	Dr. C. B. R. Kennerly	Alcoholic.
590	2	do	do	do.
5208	1	Rocky Mountains	Dr. Thos. H. Webb	do.
951	5	Fort Steilacoom, Washington.	George Stevens	do.
964	2	Tahat Plain	Dr. J. G. Cooper	do.
953	2	Humboldt Bay, California	!	do.
8055	1	Shoalwater Bay, Washington.	!	do.
901	1	Humboldt Bay, California	!	do.
972	2	Pacific R. R. Survey	Dr. J. G. Cooper	do.
8367	1	Crescent City, California	P. Schumacher	do.
10808	1	Western Oregon	H. W. Henshaw	do.
957	1	Shoalwater Bay	Dr. J. G. Cooper	do.
5495	4	Fort Umpqua, Oregon	Dr. Vollum	do.
781	3	Puget Sound	U. S. Exploring Expedition	do.
961	1	Chalanhapla	Dr. J. G. Cooper	Alcoholic (type of <i>E. atrata</i>).
22394		Vancouver Island, British Columbia.	John Macoun	Alcoholic.
22400		do	do	do.
22403		do	do	do.
22408		do	do	do.

EUTÆNIA SCALARIS Cope.

Eutania scalaris COPE, Proc. Acad. Nat. Sci. Phila., 1886, p. 306.—YARROW, Bull.

U. S. Nat. Mus., No. 24, 1883, p. 128.—COPE, Bull. U. S. Nat. Mus., No. 32,

1887, p. 73.—A. DUGÈS, *Naturelle*, 1888, p. 129, pl. XIII, fig. 17.—COPE, Proc.

U. S. Nat. Mus., 1892, p. 647.—BOCOURT, Miss. Sci. Mex., 1893, p. 768.

Thamnophis scalaris COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 369.

Tropidonotus scalaris JAN, Arch. Zool. Anat. Phys., III, 1865, p. 214.

Tropidonotus scalaris BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 204.

Form moderately slender, the tail a little less than one-fourth the total length. Head narrow, elevated, the profile sloping in front; muzzle obtuse. Temporal small, not attaining the reduced last upper labial. Front of plate narrow, half as wide as long, with concave or parallel lateral borders. Occipitals elongate. Loreal plate higher than long; one preocular, three postoculars. Superior labials, seven; fourth and fifth entering the orbit. Inferior labials, ten. Anterior genaeals longer than posterior. Scales in nineteen rows, not emarginate; lateral stripe on the second and third rows. Gastrosteges, one hundred and forty-three; an entire anal; urosteges, fifty-nine pair.

Beneath and upon the first row of scales, dark, ashy olivaceous, the latter frequently black at their bases. Second and one-half the third row of scales a little paler. The vertebral and the borders of one row on each side of it yellowish. The color of the remainder of the upper surface is brown, anteriorly shaded with olivaceous. This is crossed from the lateral to the dorsal stripe on each side by black or deep-brown transverse bars, numbering, from the head to the origin of the tail, about sixty. There is a pair of large spots just behind the occipital plates, and one involving the temporals and the whole of the occipitals, its anterior border trilobate and produced upon the vertical and superciliaries. A short yellowish vitta, extending from the posterior

angle of the former plate along the occipital suture, represents a confluent pair of occipital spots; nuchal blotches same color as head.

This species was described from a specimen from Señor R. Montes de Oca, from Jalapa, Mexico. Boulenger reports it¹ from Oaxaca and Jalisco.

Eutania scalaris Cope.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
3	Orizaba, Mexico	F. Sumichrast	Alcoholic.

EUTÆNIA PHENAX Cope.

Eutania phenax COPE, Proc. Acad. Nat. Sci. Phila., 1868, p. 134.

Tropidonotus ordinatus var. *phenax* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 210.

Eutania cyrtopsis var. *phenax* BOCOURT, Miss. Sci. Mex., 1893, p. 778.

This is a handsome and peculiar species, being the only one of the genus which is cross-banded.

Scales in nineteen rows; all keeled except the first. General form much as in *E. sirtalis*. Head rather short, muzzle obtuse, eye large, superciliary plates arched. Diameter of eye equal from same to rostral plate along the labials. Frontal shortened behind, with straight sides, equal to .75 of parietal common suture. Parietals truncate behind. Upper labials, eight; fourth and fifth in orbit. Loreal longer than high, one preocular, temporals 1-2. Inferior labials nine, sixth largest; genaeals equal. Gastrosteges, one hundred and sixty-one; anal, one; urosteges, sixty-three.

Measurements.—Total length, 23 inches 5 lines; tail, 5 inches; to rectus oris, 6 lines.

Above, reddish olive, crossed by thirty-six transverse spots, which are of a bright brownish-red with a narrow black margin. They are separated by transverse intervals of only a scale in width, hence the black margins appear as paired crossbars. These crossbars extend to the first row of scales and are as often continuous on the side as not. There is no lateral stripe, but there are black spots on the corners of the ends of the gastrosteges. The margin of the first brown spot is in form of two black lines diverging from the parietal plates backward. There is a brown bar in front of the frontal, one on the frontal, and superciliaries behind (imperfect), and a longitudinal on each parietal. No pair of light parietal spots. Labials below eye with the last black margined, otherwise light olive. Below, a strong green, unspotted. Sometimes the brown spots are interrupted on the middle line, in the position of the dorsal stripe seen in so many species of *Eutania*, but this is very exceptional, and the ground color shows no trace of stripes.

The *E. phenax* is one of the smaller species and is, so far as now known, confined to eastern Mexico.

¹ Cat. Snakes Brit. Mus., I, 1893, p. 204.

Eutania phenax Cope.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
6	Orizaba, Vera Cruz.....	F. Sumichrast.....	Alcoholic.

EUTÆNIA PULCHRILATUS Cope.

Eutania pulchrilatus COPE, Proc. Amer. Phil. Soc. Phila., 1884, p. 174; Cat. Batr.

Rept. Central Amer. and Mex., Bull. U. S. Nat. Mus., No. 32, 1887, p. 73; Proc.

U. S. Nat. Mus., XIV, 1892, p. 947.—BOCOURT, Miss. Sci. Mex., 1893, p. 767.

Tropidonotus ordinatus var. *eques* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 209.

Scales in nineteen rows. Lower row of scales smooth; urosteges, sixty-seven; a dorsal stripe; lateral stripe bordered below by a brown or black stripe; a black nuchal spot; head brown.

At first sight this species looks like the *E. flavilabris* Cope, but it has characters of the *E. eques* and adds some of its own.

The dorsal stripe, as in *E. eques*, occupies but a single row of scales. The lateral stripe occupies the adjacent edges of the second and third rows. The entire first row is covered by a broad brown band, which defines the lateral light band very distinctly below. This is not seen in either of the species above named. There are two rows of black spots between the dorsal and lateral bands, but the keels of all the scales involved in them are brown. There are sometimes spots below the lateral light line on the neck, due to interruptions in the lateral dark stripe. A large nuchal black spot, which is notched behind by the median band and sometimes divided. Superior labials black-bordered posteriorly, especially the sixth, where the border is sometimes very wide. Head above brown; lower surfaces uniform greenish, except tail, which is yellowish below. Occipital spots very indistinct.

The head is not very distinct from the neck. The frontal plate is wider than the supraorbitals. Gastrosteges, one hundred and fifty-eight; urosteges, sixty-seven.

Measurements.—Total length, 465 mm.; length of tail, 105 mm.

This handsome species varies in the intensity of its dark colors, the ground between the dorsal spots being sometimes so dark as to give the spaces between the yellow stripes the appearance of uniform bands. In such specimens the lateral dark stripe is least interrupted.

Boulenger unites this species with the *E. eques*. It, however, belongs to a different section of the genus.

According to Dugès, this species is found in the States of Guana-juato and Mexico. I have three specimens from the State of Mexico, from Mr. Hoeje; four from the State of Puebla, from the Exploring Commission, and one from Zacualtipan (Hidalgo), from Dr. S. Bernad.

EUTÆNIA SUMICHRASTII Cope.

Eutania sumichrastii COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 306; Proc. Amer. Phil. Soc., XXII, 1884, p. 174; Proc. U. S. Nat. Mus., XIV, 1892, p. 647.—YARROW, Bull. U. S. Nat. Mus., No. 24, 1883, p. 129.

Tropidonotus (Eutania) sirtalis var. *infernalis* GARMAN, Mem. Mus. Comp. Zool., Cambridge, 1883, p. 139.

Tropidonotus ordinatus var. *sumichrasti* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 209.

Eutania cyrtopsis var. *sumichrasti* BOCOURT, Miss. Sci. Mex., 1893, p. 775.

Scales in nineteen rows; no longitudinal bands. Olive brown, with four series of small black spots, and a trace of two exterior anteriorly; eight superior labials, all higher than long except the seventh, no black margin on the sixth or posterior margin of eighth, but a strong black band from eye across posterior margin of seventh to mouth. Sides of head white, extending upward as two areas, margining each occipital; behind each a black nuchal spot separated by a narrow white line from its fellow and extending over occipital plates and half of frontal; prefrontals transverse.

The markings of this species are entirely peculiar; it is also distinguished by the transverse or narrow prefrontals and internasals.

To this description I add some notes taken from a third specimen. The frontal plate is wider than the supraorbitals. There are eight superior labials, and the orbit is bounded by the fourth and fifth. Temporals, 1-2; orbitals, 1-3. There is a trace of a dorsal stripe on the nape, which divides the nuchal spot into two. No postoral crescent. Below the square lateral spots on the sides of the neck is a row of smaller, alternating square spots, which serve to define a lateral stripe for a short distance. Superior labials brownish yellow, brown edged. Inferior surfaces uniform dirty yellow.

The keels of the scales are very strong, except those of the first row, which are obsolete. Gastrosteges, one hundred and forty-eight; urosteges, sixty-five.

Measurements.—Total length, 265 mm.; length of tail, 65 mm., or one-fourth of the total.

Eutania sumichrastii Cope.

Number of specimens.	Locality.	From whom obtained.	Nature of specimen.
2	Orizaba, Vera Cruz.....	F. Sumichrast.....	Alcoholic.

Bocourt reports this species as having been sent from Coban, Vera Paz, to the Museum of Paris. I have it also from Zacualtipan, in the State of Hidalgo.

EUTÆNIA CHRYSOCEPHALA Cope.

Eutænia chrysocephala COPE, Proc. Amer. Phil. Soc., 1884, pp. 173, 174; Bull. U. S. Nat. Mus., No. 32, 1887, p. 73; Proc. U. S. Nat. Mus., XIV, 1892, p. 647.—BOCCOURT, Miss. Sci. Mex., 1893, p. 762.

Tropidonotus chrysocephalus BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 203.

Scales in seventeen rows, inferior row heeled; urosteges, eighty-one; no dorsal stripe; a large black nuchal spot; head yellow; body slender, with a wide flat head, with a large eye. The size of the latter contracts the frontal plate, so that it is not wider than the superciliaries posteriorly. The scuta are otherwise as usual. Superior labials, eight, none higher than long, fourth and fifth below the orbit. The inferior surfaces are darker than in *E. eques collaris*, which causes a better definition of the lateral line than in that species. There are representations of two rows of lateral black spots, but they are merely black scale borders, those of the inferior row the more distinct. A similar row of black edges on the first row of scales. All of these spots become distinct on the sides of the neck. Nuchal spot large, black, and with a shallow notch behind, no occipital or other spots on the head. The gastrosteges have black bases, a character not seen in any of the other species referred to.

Gastrosteges, one hundred and fifty-one.

Measurements.—Total length, 430 mm.; length of tail, 135 mm., or one-third the total.

This handsome species was obtained at Orizaba by Dr. Sumichrast. Boulenger¹ records it from Omilteme, in the State of Guerrero, which is at an elevation of 8,000 feet.

Eutænia chrysocephala Cope.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
1	Orizaba, Vera Cruz.....	F. Sumichrast.....	Alcoholic.

EUTÆNIA SIRTALIS Linnaeus.

Eutænia sirtalis COPE, Check-list N. Amer. Batr. Rept., 1875, p. 41.

Eutænia sirtalis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 31.

Coluber sirtalis LINNÆUS, Syst. Nat., I, 1766, p. 383.—GMELIN, Linnæus, Syst. Nat., 13th ed., I, Pt. 3, 1788, p. 1107.—FITZINGER, Neue Class. Reptilien, 1826, p. 58.—HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 352.—STORER, Rep. Rept. Mass., 1839, p. 221.

Tropidonotus sirtalis HOLBROOK, N. Amer. Herp., III, 1842, p. 41, pl. xi.

Tropidonotus bipunctatus SCHLEGEL, Ess. Phys. Serp., 1837, p. 320.—DUMÉNIL and BIBRON, Erp. Gén., VII, 1854, p. 582.

Tropidonotus tania DEKAY, New York Fauna, Rept., 1842, p. 43, pl. XIII, fig. 27.

Coluber ordinatus LINNÆUS, Syst. Nat., I, 1766, p. 379.—MERREM, Tentamen, p. 93.

Tropidonotus ordinatus BOIE, Isis von Oken, 1827, p. 535.—HOLBROOK, N. Amer. Herp., IV, pl. XII.—GÜNTHER, Cat. Colubr. Snakes Brit. Mus., 1858, p. 73.

Tropidonotus ordinatus var. *sirtalis* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 206.

¹ Cat. Snakes Brit. Mus., I, p. 202.

Head distinct oval; muzzle and orbit medium. Body moderately robust; tail between one-fourth and one-fifth the total length, very rarely shorter than one-fifth or larger than one-fourth. Superior labial plates eight, all higher than long, except the first and second. Loreal not longer than high; oculars 1-3; temporals 1-2-3. Frontal much wider than superciliaries; parietals rather short. Scales in nineteen rows, not very narrow, not emarginate except the inferior three rows; the first as deep as long and feebly keeled. Postgenaeals longer than pregenaeals, generally separated to the base by small scales.

Color varying from light green through olivaceous to black, traversed by three longitudinal stripes, of which the laterals are not well defined below, and all three may be wanting. Spaces between them uniform, or marked by two rows of alternating black or brown spots, of which those of the superior row may or may not be confluent with each other. In most of the forms there is a round black spot on the anterior part of each gastrostege about 5 mm. from the end. Belly generally light bluish green, but varying to darker and black.

This species ranges over all North America, being limited to the north by its capacity for enduring cold and extending south to Guatemala. In its essential characters it is quite constant, but it varies in color so as to include several races or subspecies. Of one hundred and two specimens examined but three have twenty-one rows of scales, the rest having nineteen. Of the same number examined but six have eight superior labials on both sides, and the additional labial is generally smaller than the others so as to be an evident abnormality, though sometimes it is regular. In nine specimens the additional labial appears on one side only. These abnormalities are distributed as follows:

Subspecies.	Number exam- ined.	21 rows of scales.	Superior labials 8-8.	Superior labials 8-7.
<i>E. s. dorsalis</i>	4	0	0	1
<i>E. s. sirtalis</i>	53	1	3	4
<i>E. s. parietalis</i>	37	2	2	4
<i>E. s. pickeringii</i>	8	0	1	0
Total	102	3	6	9

The subspecies differ as follows:

I. No stripes nor spots above.

Color green; a spot near end of each gastrostege..... *E. s. graminea*.

II. No stripes; two rows of square spots on each side.

Spots all distinct, not separated by red interspaces; gastrostegeal spots
E. s. ordinata

III. Both stripes and spots.

Spots all distinct, not separated by red interspaces; gastrostegeal spots; dorsal stripe yellowish, not black bordered; spots from 75 to 80..... *E. s. sirtalis*.

Spots distinct, not separated by red interspaces; the anterior become opposite and confluent, and extending across the lateral stripe forming half crossbars; gastrostegeal spots..... *E. s. semifasciata*

Inferior row of spots only visible, separated by red interspaces; dorsal stripe red, black bordered; gastrostegeal spots; lateral spots from 70 to 83

E. s. dorsalis

Superior row of dorsal spots confluent into a longitudinal band in contact with the inferior row of spots, which are separated by red interspaces; lateral spots from 80 to 90; no gastrostegal spots *E. s. parietalis*
 Like the last, but the inferior spots connected by a black band inclosing the red spots; throat and lips red; belly black; spots from 64 to 82..... *E. s. concinna*

IV. Bands, but no spots.

Three longitudinal lines on the middles of the second and median rows of scales, mostly blue; belly black..... *E. s. pickeringii*
 Three well-defined bluish bands of usual width; belly black..... *E. s. trilineata*
 A yellow dorsal band; the lateral less distinct; belly green and with gastrostegal spots..... *E. s. obscura*
 On each side a red stripe between two of black..... *E. s. tetrataenia*.

These subspecies are distributed as follows:

Eastern region.	Australoriparian region.	Central region.	Pacific region.
<i>E. s. graminea</i>			
<i>E. s. ordinata</i>	<i>E. s. ordinata</i>		
<i>E. s. sirtalis</i>	<i>E. s. sirtalis</i>		
		<i>E. s. dorsalis</i>	
<i>E. s. obscura</i>	<i>E. s. obscura</i>	<i>E. s. parietalis</i>	<i>E. s. parietalis</i>
<i>E. s. semifasciata</i>			<i>E. s. concinna</i>
			<i>E. s. trilineata</i>
			<i>E. s. pickeringii</i>

Transitions between these forms are common. The disappearance of the spots and stripes of *E. s. sirtalis*, which culminates in the *E. s. graminea*, does not occur abruptly, but transitional specimens are not difficult to find. Transitions to the dark form, *E. s. obscura*, are not rare, the spots becoming, as in the corresponding case in *E. elegans*, confused and blended on the posterior part of the body first. The transition to the absence of spots also appears first posteriorly, Cat. No. 7798 having anteriorly the color marking of *E. e. parietalis*, and posteriorly that of *E. e. dorsalis*. On the other hand, the *E. e. parietalis* shows every gradation to the form *E. e. obscura*, by confluence of the spots. The spots are largest and fewest in *E. s. sirtalis*, where they range from seventy-six to seventy-eight. In *E. s. parietalis* they are more numerous, ranging from eighty-three to eighty-eight. *E. s. dorsalis* covers both series, ranging from seventy to eighty-one.

EUTÆNIA SIRTALIS GRAMINEA Cope.

Eutænia sirtalis graminea COPE, Proc. U. S. Nat. Mus., XI, 1888, p. 399.

I describe a typical specimen from Indiana. This form is a uniform light green above, below yellow clouded with green. Lips, chin, and throat uniform yellow. No stripes or spots on the body, nor markings of any kind on the head. Scales, nineteen rows; superior labials, seven; temporals, 1-3, first large; gastrosteges, one hundred and fifty; anal, one; urosteges, sixty-six pair, four of the latter undivided; lowest row of scales smooth.

Measurements.—Length, 495 mm; tail, 107 mm.

This form is the extreme in the direction taken by the *E. s. ordinata*, where the bands are entirely wanting, but the quadrate lateral spots remain. In the entire absence of black marks on the labial and abdominal plates, this form differs also from its immediate allies. The coloration is that of *Cyclophis æstivus*.

In a second specimen (Cat. No. 14642) from Tuckermuck, Massachusetts, a small spot is to be seen on a few of the gastrosteges, while on two from Columbus, Ohio, and one from Androscoggin, Maine, the gastrostegal spots are distinct. On one of the former, skeletons of black spots are visible behind the head. In one of them the tail enters four and one-third times into the total length.

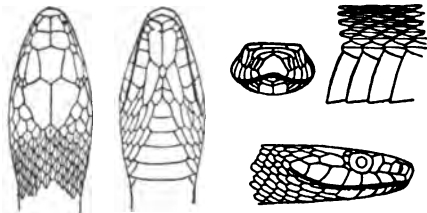


Fig. 298.

EUTÆNIA SIRTALIS GRAMINEA COPE.

=1.

Tuckermuck, Massachusetts.

Cat. No. 14642, U.S.N.M.

Eutænia sirtalis graminea Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
9254	1	Columbus, Ohio.....	J. M. Wheaton.....	Alcoholic.
1004	1	do.....	do.....	do.
1023	1	Androscoggin, Maine.....	do.....	do.
14642	1	Tuckermuck, Massachusetts.....	Dr. H. J. Bigelow.....	do.
21696	.....	Maumee River, Grand Rapids, Ohio.....	U. S. Fish Commission.....	do.
21699	.....	Sugar Creek, Lima, Ohio.....	do.....	do.
21700	.....	Sugar Creek, Cloverdale, Ohio.....	do.....	do.
21701	.....	Sugar Creek, Lima, Ohio.....	do.....	do.

EUTÆNIA SIRTALIS ORDINATA Linnæus.

Eutænia sirtalis ordinata COPE, Check-list N. Amer. Batr. Rept., Bull. U. S. Nat.

Mus., No. I, 1875, p. 41; Wheeler's Survey W. 100th Mer., V, Zoology, p. 546.

Tropidonotus ordinatus HOLBROOK, N. Amer. Herp., 1842, p. 45, pl. XII.

Eutænia ordinata BAIRD and GIRARD, Cat. N. Amer. Reptiles, Pt. 1, Serpents, 1853, p. 32.

Coluber ordinatus LINNÆUS, Syst. Nat., I, 1766, p. 379.—GMELIN, Linnæus Syst.

Nat., 13th ed., I, Pt. 3, 1788, p. 1097.—HARLAN, Journ. Acad. Nat. Sci. Phila.,

V, 1827, p. 349.

Tropidonotus ordinatus HOLBROOK, N. Amer. Herp., III, 1842, p. 45, pl. XII.

Vipera gracilis maculatus CATESBY, Nat. Hist. Carol., II, 1743, p. 51, pl. LI.

Vipera viridis maculatus CATESBY, Nat. Hist. Carol., II, 1743, p. 53, pl. LIII.

Eutænia sirtalis melanota SMITH, Higley, Trans. Wisconsin Acad. Sciences, VII, p. 163.

* *Tropidonotus ordinatus* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 206.

General color greenish brown or olive. Vertebral yellowish line more or less inconspicuous. Lateral stripe on the second and third rows of scales very little evident. In fact, it might be almost said to be want-

ing, but for a faint trace. Three series of small square dark blotches on each side, about eighty-five in number from head to anus. The first is on the outer row of dorsal scales, involving the edges of the contiguous scales. The second on the fourth row; the third on each side of the dorsal stripe, both like the first, involving the edges of and intervals between the contiguous scales; indeed, on stretching apart the skin, the black spots are seen to be converted into a network of black

along the skin. Beneath greenish white, with spots of black near each end of the abdominal scutellæ. Upper labial plates all prominently edged vertically with black.

This species strongly resembles *E. sirtalis*, especially the spotted varieties. It may, however, be readily distinguished by the three regular series of tessellated black spots on each side, their prominence, and their number,

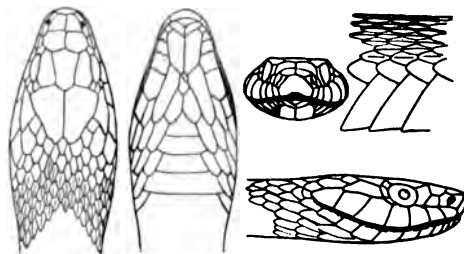


Fig. 299.

EUTAMIAS SIRTALIS ORDINATA LINNÆUS.

— 1.

Adirondack Mountains, New York.

Cat. No. 1050, U.S.N.M.

about eighty-five, not seventy. The lateral stripe is nearly absent, and the dorsal quite indistinct. The lower row of blotches is below and along the place of the lateral stripes. The occipital black patch is much larger than in *E. sirtalis*, and the labials more margined.

Baird and Girard give the following scutal formulæ, and proportions in inches.

Locality.	Gastrosteges.	Urosteges.	Scales.	Length.	Tail.
Riceboro, Georgia	139	68	19	28	7
Do	141	55	19	21	5½
Georgia	152	79	19	14	3½

In the most typical specimen of this species (Cat. No. 5222; northern Alabama), the dorsal spots of the superior row connect across the middle line, and do not connect with the spots of the inferior row. The form which is common about the eastern shore of Buzzards Bay and other parts of Massachusetts (Cat. No. 13330) has the same character, but the spots are larger and the general colors darker.

This form or subspecies passes in one direction into the *E. s. graminea*, and in the other into the *E. s. sirtalis*, as the spots and bands are more or less distinct. The spots are very indistinct in Cat. Nos. 1023, 1047, 1049, 1050, 7808, 8991, and 14732, and traces of the stripes are visible in Cat. Nos. 996, 1023, 1049, and 14732.

A specimen (Cat. No. 1033) from Blount County, Tennessee, is a melanistic form of this subspecies. The color is entirely black, except that the narrow interspaces between the large square alternate; lateral spots are a little paler; chin, throat, and superior labials below orbit, yellowish.

Eutania sirtalis ordinata Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1050	1	Adirondacks, New York			Alcoholic.
1023	2	Androscoggin, Maine		Dr. C. Girard	do.
7799	1	Halifax, Nova Scotia			do.
4764	1	Martha's Vineyard, Massachusetts.		Dr. Wm. Stimpson	do.
5222	1	Alabama		W. M. Stewart	do.
1038	1	Eutaw, Alabama		Prof. A. Winchell	do.
1047	1	Tioga County, New York		E. E. Howell	do.
8991	1	Woods Hole, Massachusetts.	July —, 1875	V. N. Edwards	do.
996	1	Centerville, Maryland			do.
1049	1	Grosse Isle, Michigan			do.
7808	1	Lebanon, Indiana			do.
13330	1	Gloucester, Massachusetts		Capt. Cunningham	do.
14732	1	Montgomery County, Maryland.		C. S. Beachler	do.
1033	1	Blount County, Tennessee			do.

A specimen closely resembling this form was sent me by Mr. Edward Wilkinou from Batopilas in the mountains of southern Chihuahua.

EUTÆNIA SIRTALIS SIRTALIS Linnaeus.

Eutania sirtalis sirtalis COPE, Check-list N. Amer. Batr. Rept., Bull. U. S. Nat. Mus., No. 1, 1875, p. 41.—YARROW, Rept. U. S. Geog. Exp. Surv. W. 100th Mer., V, p. 546.

Eutania sirtalis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 30.

Tropidonotus ordinatus var. *sirtalis* BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 206.

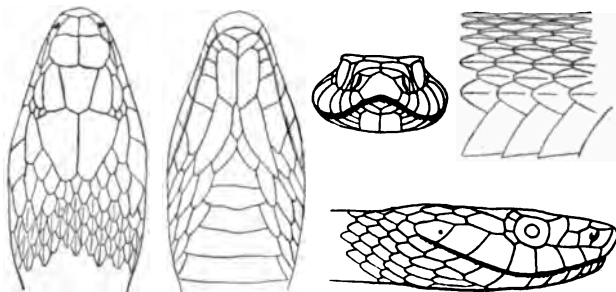


Fig. 300.

EUTÆNIA SIRTALIS SIRTALIS LINNÆUS.

=1.

Clarke County, Virginia.

Cat. No. 720, U.S.N.M.

Color above the lateral stripes dark olive, in old specimens dark brown, beneath greenish white. A narrow, rather indistinct vertebral greenish-yellow line. Three series of small indistinct spots on each side, of about seventy from head to anus. The first series is along the exterior dorsal row, the spots about two scales apart. This is sometimes entirely wanting. The second series is on the third, fourth, and

fifth rows from the abdomen; the third upon the eighth and ninth. In many cases the last-mentioned rows have the spots on opposite sides more or less confluent, giving the appearance of a single median series. These rows of spots are sometimes of a dark chestnut-brown, at others nearly black, and often so blended with the olivaceous of the back as to be scarcely discernible. Numerous short white lines visible on stretching the skin.

Although the first, second, and third exterior dorsal rows of scales are colored like the abdomen, yet a lighter shade on the second and third gives indication of a lateral stripe.

The bases of the abdominal scales on each side near the outer extremities have a black blotch. There is also the usual double spot on the occiput, not areolated. The dark spotting on the sides belongs more or less to the skin between the scales, in some cases merely tinging the edges of the latter.

The relative length of the tail to the total, as observed in 38 specimens, is as follows: Five and one-fifth times in total length, 1 specimen; five and one-fifteenth, 1 specimen; four and eleven-twelfths, 1; four and five-sixths, 2; four and four-fifths, 2; four and three-fourths, 5; four and three-fifths, 1; four and two-fifths 3; four and one-third, 1; four and one-fourth, 1; four and one-fifth, 1; four and one-eighth, 2; four and one-sixth, 3; four and one-tenth, 1; four and one-twelfth, 2; four, 2; three and nine-tenths, 1; three and three-fourths, 2.

The definition of the spots in this subspecies varies, some having them of smaller and others of larger size, thus exposing more or less of the ground color.

The *E. s. sirtalis* is the most abundant snake of the eastern region, and it is common in the Austroriparian, including the Floridan district. Its occurrence in the Texan district is uncertain, as I have not seen it from west of Dallas on the north and Galveston on the south. From the fact that it occurs in the wet portions of eastern Mexico and Guatemala I suspect that it will be also found in southern Texas.

Specimens derived from the Central, Pacific, and Sonoran regions, referred to this subspecies by various persons, I find on examination to be referable to other species or subspecies. No specimens of the *E. sirtalis sirtalis* have come under my observation from those regions. The most western locality from which the National Museum possesses a specimen is Fort Kearney (now Junction City), Kansas, which is at the western limit of the eastern third of that State; Cat. No. 621.

A color variation is exhibited by Cat. No. 1008, from Bedford, Long Island, New York, where the black spots of the superior rows connect with each other across the median dorsal stripe, cutting the latter into sections. A corresponding peculiarity is seen in some specimens of *E. s. ordinata*. In Cat. No. 9992 the spots approach, but do not join.¹

¹ *Eutania pulchrilatus* Cope, Proc. Amer. Phil. Soc., 1884, pp. 173, 174.

Scales in nineteen rows; superior labials, seven. Lower rows of scales wide, smooth. The head is not very distinct from the neck. The frontal plate is wider than the supraorbitals. Gastrosteges, one hundred and fifty-eight; urosteges, sixty-seven.

Measurements.—Total length, 465 mm.; of tail, 105 mm.

The dorsal stripe, as in *E. eques*, occupies but a single row of scales. The lateral stripe occupies the adjacent edges of the second and third rows. The entire first row is covered by a broad brown or black band, which defines the lateral light band very distinctly below. This is not seen in either of the species above named. There are two rows of black spots between the dorsal and lateral bands, but the keels of all the scales involved in them are brown or yellow. There are no spots below the lateral light line, either on the neck or elsewhere. A large nuchal black spot, which is notched behind by the median band. Fifth superior labial yellow; the sixth black, with a yellow spot in the superior anterior corner. Seventh, black-edged in front; others black-bordered behind. A yellow postoral spot. Head above black or brown; lower surfaces uniform greenish-yellow, except tail, which has a median dark line below. Occipital spots very indistinct.

This handsome species has been sent me from Pueblo and central Mexico and from Zacualtipan Hidalgo. The typical specimen was received from Dr. Dugès, of Guanajuato, but the exact locality is unknown. It may enter the Nearctic fauna.

Baird and Girard give the following formulæ, the length in inches:

Locality.	Gastrosteges.	Urosteges.	Scales.	Length.	Tail.
St. Lawrence County, New York.....	157		19	15	3½
Westport, New York.....	151	80	19	21	5½
Adirondack Mountains, New York.....	146		19	24½	
Adirondack Mountains, New York.....	151		19	20½	
Do.....	148		19	14½	
Androscoggin, Maine.....	155	66	19	21½	4½
Clarke County, Virginia.....	151		19	26	
Do.....	160	56	19	18½	3½
Do.....	145		19	10½	2½
Centerville, Maryland.....	151	75	19	10½	2½
Foxburg, Pennsylvania.....	150	70	19	24	5½
Do.....	147		19	18	4
Abbeville, South Carolina.....	155		19	11½	3
Kemper County, Mississippi.....	139	60	19	29½	6
Do.....	138		19	11½	

Prof. O. P. Hay¹ gives the following account of the habits of *Eutænia sirtalis sirtalis*:

As to *E. s. sirtalis*, Prof. F. W. Putnam² states that a female taken July 22 contained forty-two nearly developed young. Each of these was 5½ inches long. The mother snake was 35 inches long. Dr. J. Schneck, of Mount Carmel, Illinois, writes³ that seventy-eight were taken from a female. He implies that he saw this done. C.

¹ Proc. Indiana Acad. Sci., 1891, p. 110.

² American Naturalist, II, 1869, p. 134.

³ Idem., XVI, 1883, p. 1008.

Few Seiss says¹ that the sexes of this species copulate in early spring and produce from thirteen to eighty young. That he has seen the latter from a single snake he does not say. Drs. Coues and Yarrow refer² to the habits of *Eutania sirtalis parietalis* as observed by them in Montana during the month of August. "At this season of the year all the female individuals observed were gravid with nearly matured embryos. Like others of the genus, this species is ovoviviparous, the young being 6 inches in length when born." In a specimen of *E. s. sirtalis* (No. 17960, U.S.N.M.), captured near the city of Indianapolis by Dr. Alex. Jameson about August 1, I find thirty-nine partially developed young. Of these, twenty-five are in the right uterus. The young measures 6 inches in length. There is a considerable amount of yolk still remaining attached to these young, a fact which indicates that they will increase in size before birth. An examination of the mouth of some of these little snakes shows that the egg-tooth is present. The membrane which surrounds each egg is quite thin. The female bearing this lot of young is 33 inches in length. Another female (No. 17961, U.S.N.M.), from Paris, Illinois, of nearly the same size, contained about thirty-five young snakes, these being packed together so densely in the mother's body that it was difficult to determine the number accurately without removing them. They are each 7 inches long, and are evidently just ready to be expelled. An examination of about half a dozen of them failed to reveal the presence of the egg-tooth, which has therefore been shed. Nor could I determine with certainty that any egg-covering was present. The yolk of the egg, also, is wholly consumed. On opening these young snakes I find little or none of the yolk within the body. In this respect they contrast strongly with the young of the rattlesnakes. The young garter snakes must from the first depend on their own activities for support. This accords well with the report of Mr. C. Few Seiss, that the young of a female kept in confinement began to feed shortly after birth, struggling vigorously with one another for the earthworms thrown them. At what time during the summer the Paris, Illinois, specimen was captured I do not know. Seiss's statement that the sexes of *E. s. sirtalis* pair in the early spring has already been mentioned.

Prof. F. W. Putnam³ informs us that on July 1, in a female 35 inches long he found forty-two nearly developed young, each of which was 5.5 inches long. Dr. J. Schneek, of Mount Carmel, Illinois, says⁴ that from a female 35 inches long he took seventy-eight young from 3 to 7 inches in length. They were pressed from the vent. The first twenty were free, the others confined within the egg coverings. A female from Paris, Illinois, contained thirty-five young, each 7 inches long. The food-yolk was all gone and the egg-tooth shed. It appears that the young are born late in the summer or early in the fall. The sexes are said to unite in September or in October, but it seems probable that this also occurs early in the spring. This is one of the snakes which has the reputation of swallowing its young when they are in peril. Col. N. Pike, who is an accurate observer, assured Dr. Goode⁵ that he had seen the garter snake afford its young family temporary protection in its throat, from which they were soon noticed to emerge.

On the approach of cold weather these snakes seek some opening in the earth and then become dormant. In some instances they appear to collect in considerable numbers where they pass their winter slumber. We thus occasionally hear of bundles of snakes being plowed up. E. L. Ellicott relates⁶ having seen very early in the spring, in Maryland, a bundle of garter snakes in which some hundreds of them could be counted. It is altogether probable that such assemblages are determined partly by the sexual impulses. The garter snake leaves its place of hibernation apparently as soon as the first warm days come, although they may relapse again into the dormant condition. At Irvington I have taken them as early as the 7th of March.

¹ Scientific American, LXIII, p. 105.

² Bull. U. S. Geol. and Geog. Surv., IV, p. 277.

³ American Naturalist, II, p. 134.

⁴ American Naturalist, XVI, p. 1008.

⁵ Proc. Amer. Assoc. Sci., 1873, p. 182.

⁶ American Naturalist, XIV, p. 206.

Dr. Benjamin Sharp¹ observed the process of exuviation in the garter snake. Two specimens were kept in an aquarium. When observed one had just crawled out of the water and then shrugged and shook itself. Finding a narrow place, it pressed itself in so that the skin parted along the jaws. This was pushed back behind the head. Then the snake crawled through the opening, escaping from the skin and leaving it turned inside out. The operation required less than a minute. One of the skins was without rent or loss of a scale. This occurred on April 13. Some specimens that I kept for a while shed the skin about June 1. In case the snake can not have access to water the shedding of the skin is a more prolonged operation.

Eutania sirtalis sirtalis Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
982	1	Florida			Alcoholic.
938	1	Indian River, Florida		Lieut. R. S. Williamson, U. S. A.	do.
996	1	Centerville, Maryland			do.
968	1	Tyree Springs, Tennessee		Prof. R. Owen	do.
5491	1	Matamoras, Mexico		Lieutenant Couch, U. S. A.	do.
7788	1	Charleston, South Carolina			do.
1791	4	Lake Superior		Dr. Geo. Suckley, U. S. A.	do.
720	2	Clarke County, Virginia		Dr. C. B. R. Kennerly	do.
995	2	St. Louis, Missouri		Dr. Geo. Engelmann	do.
1044	2	Racine, Wisconsin	—, 1853	Prof. S. F. Baird	do.
881	1	Yellowstone River		Dr. F. V. Hayden	do.
105	1	Republican River			do.
8964	3	Kinston, North Carolina		J. W. Milner	do.
8820	1	Union County, Tennessee		J. N. B. Scarborough	do.
9696	2	Arlington, Florida	Apr. —, 1878	G. Brown Goode	do.
12038	3	Mount Carmel, Illinois	Nov. —, 1881	L. M. Turner	do.
1042	4	Foxburg, Pennsylvania	—, 1848		do.
1049	1	Grosse Isle, Michigan		!	do.
10187	1	Fairfax County, Virginia	May —, 1879	J. B. Greene	do.
440	1	(?)		Duméril and Bibron	Alcoholic type.
975	2	Kemper County, Mississippi		D. C. Lloyd	do.
5378	4	Selkirk Settlement		R. Kennicott	Alcoholic.
1008	1	Bedford, Long Island			do.
7791	1	Lake Superior		R. Kennicott	do.
4775	1	Fort Riley, Kansas		H. Brandt	do.
5231	1	Neosho Falls, Kansas		B. F. Goss	do.
1009	1	Port Huron, Michigan	—, 1853	Prof. S. F. Baird	do.
7807	1	Washington, District of Columbia		Coffin	do.
7808	2	Lebanon, Indiana		S. B. Davis	do.
893	1	San Francisco, California		Lieut. R. S. Williamson, U. S. A.	do.
1031	1	Eutaw, Alabama		Prof. A. Winchell	do.
984	2	Somerville, North Carolina		J. C. McNair	do.
994	1	Jackson, North Carolina		Fitzgerald	do.
8069	1	Foxburg, Pennsylvania			do.
13404	4	Boston, Mass		T. Roosevelt	do.
9124	1	Havre de Grace, Maryland		J. W. Milner	do.
11436	1	Highland, Maryland		!	do.
1029	1	New Orleans, Louisiana, to Galveston, Texas.		!	do.
12910	1	New Orleans, Louisiana		Dr. R. W. Shufeldt	do.
8013	1	!		C. B. Adams	do.
11995	1	Georgiana, Florida		Wm. Wittfield	do.
14558	2	Mississippi River, Illinois		H. C. Bumpus	do.
6301	1	Fort Jessup, Arkansas		!	do.
7759	1	Washington, District of Columbia		!	do.
12034	1	Mount Carmel, Illinois		L. M. Turner	do.
9992	1	Middletown, Connecticut		W. H. Barnes	do.
13602	1	Lucknow, Ontario		J. H. Garner	do.
989	1	St. Simons Island, Georgia		!	do.
621	1	Fort Kearney, Kansas		W. S. Wood	do.
1040	1	Liberty County, Georgia		!	do.
14543	1	Massachusetts		H. W. Henshaw	do.
12910	1	New Orleans, Louisiana		Dr. R. W. Shufeldt	do.
13059	1	do		do	do.
13072-83	13	do		do	do.
14707	1	Virginia		W. H. Von Bayer	do.
15841-2	1	Foxburg, Pennsylvania		Dr. D. W. Prentiss	do.

¹ Proc. Acad. Nat. Sci. Phila., 1890, p. 149.

Eutænia sirtalis sirtalis Linnaeus—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
16265		Cranberry, North Carolina	.....	P. L. Jouy.....	Alcoholic.
16266		Summit Roan Mountain, North Carolina.	.....	do.....	do.
17456		Washington, District of Columbia.	.....	J. D. Figgins.....	do.
17660		do.....	.....	H. W. Henshaw.....	do.
17960		Indianapolis, Indiana.....	.....	O. P. Hay.....	do.
17961		Paris, Illinois.....	.....	do.....	do.
18026		District of Columbia.....	.....	George Marshall.....	do.
18040-50		Eckington, District of Columbia.	.....	N. P. Scudder.....	do.
20382		District of Columbia.....	.....	Theodore Munger.....	do.
20477		Jackson City, Virginia.....	.....	E. A. Preble.....	do.
20542		Port Clinton, Ohio.....	.....	E. M. Hasbrouck.....	do.
20691		Syracuse, New York.....	.....	do.....	do.
22334		Kissimee River, Oscola County, Florida.	.....	Wm. Palmer.....	do.
19043-5		Takoma Park, District of Columbia.	.....	Dr. R. W. Shufeldt.....	do.
21693-94		Cedar Creek, Waterloo, Indiana.	.....	U. S. Fish Commission.....	do.
21095		Indian Lake, Waterloo, Indiana.	.....	do.....	do.
21606		Fish Lake, Hamilton, Indiana.	.....	do.....	do.
21697		Maumee Basin, Indiana.....	.....	do.....	do.
22390		London, Ontario, Canada.....	.....	H. H. and C. S. Brimley.....	do.

EUTÆNIA SIRTALIS OBSCURA Cope.

Eutænia sirtalis obscura COPE, Check-list N. Amer. Batr. Rept., 1875, p. 41.—YARROW, Reptiles U. S. Geog. Survey W. of 100th Mer., 1875, V, p. 546.

A specimen described by Baird and Girard under the head of *Eutænia sirtalis*, from Westport, New York, is uniformly blackish between the longitudinal stripes, when the epidermis is removed, and brown when it is present, the black spots being entirely fused. The keels of the scales are of a lighter brown. The belly is grayish green, with black spots near the ends of the gastrosteges, extending from the base, as in the typical *E. s. sirtalis*. In this respect it differs from the *E. s. trivittata*.

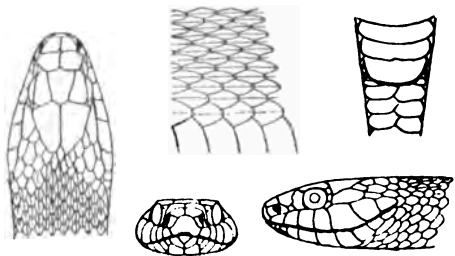


FIG. 301.

EUTÆNIA SIRTALIS OBSCURA COPE.

1.

Westport, New York.

Cat. No. 974, U. S. N. M.

In no other specimen have the spots disappeared by

fusion, leaving the stripes intact, so perfectly as in this specimen. In those individuals (Cat. No. 1019) from the Lac qui Parle, Minnesota, the fusion is complete as to the superior row of spots, but the inferior may be seen faintly outlined on stretching the skin, as in some of the dark forms of *E. s. parietalis*. In a specimen in my private collection from Mitchells Bay, Ontario (Dr. J. H. Garnier), the spots are nearly obliterated and can not be defined anywhere, and the dorsal stripe is very obscure on the posterior half the length; belly normal.

Eutania sirtalis obscura Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
974	5	Westport, New York .....	.....	S. F. Baird	Alcoholic.
1019	3	Lac qui Parle, Minnesota.	—, 1854	A. L. Riggs	do.

The numerous specimens referred to here by Yarrow in his Check-list, pages 126 and 127, belong to other subspecies.

EUTANIA SIRTALIS SEMIFASCIATA Cope.

Eutania sirtalis semifasciatus COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 662.

This subspecies or geographical race is represented by a number of specimens in the national collection from northern Illinois and Wisconsin. It resembles in general the *E. s. sirtalis* in colors and proportions.

The lower surfaces and the stripes are olivaceous, and the lateral and median stripes are separated by two rows of spots, which occupy the entire width of the space on the skin, but which do not touch each other as scale markings, the upper row being ranged along the median stripe and the lower along the lateral stripe. The peculiarity of the form consists in the fact that

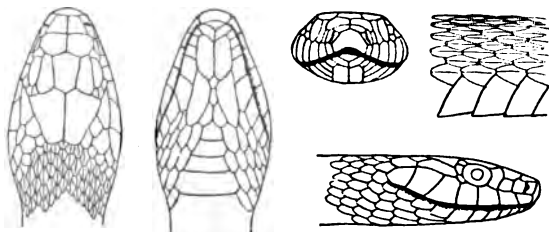


Fig. 302.

EUTANIA SIRTALIS SEMIFASCIATA COPE.

= 1.

Wisconsin.

Cat. No. 1051, U.S.N.M.

on the anterior fifth or sixth of the length of the body the spots of the inferior row extend across the lateral stripe, breaking it up into sections. In many of the specimens the spots of the superior row become opposite to those of the inferior row and join them, and the latter again join a row which is below the lateral stripe. The three rows of spots thus become confluent from crossbars interrupted only by the median dorsal stripe, as in the *Eutania scalaris*. The bars are much less regular than in that species, the part that crosses the lateral stripe being distinctly contracted and the superior part being much widened.

Young specimens recently hatched (150 mm.) exhibit the same color character as the adults.

In four specimens (Cat. No. 8070) of this form the tail measures, respectively, four and eleven-twelfths, four and two-fifths, four and three-fifths, four and five sixths of the total length. Gastrosteges in one of the same, one hundred and fifty-three; anal, one; urosteges, sixty-one.

Measurements.—Length of same specimen, 520 mm.; length of tail, 104 mm. Length of a larger specimen, 914 mm.; of tail, 196 mm. In sev-

eral of the specimens a delicate black line borders the median stripe on each side.

Eutania sirtalis semifasciata Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
8070	24	Aux Plaines, Illinois	R. Kennicott.....	Alcoholic.
1018	2	do.....	do.....	do.
1051	1	Wisconsin.....	.....	do.

In the lot Cat. No. 8070 are included three specimens of the *E. sirtalis sirtalis*.

EUTÆNIA SIRTALIS DORSALIS Baird and Girard.

Eutania dorsalis COPE, Check-list N. Amer. Batr. Rept., 1875, p. 41; Proc. U. S. Nat. Mus., XIV, 1892, p. 663.

Eutania dorsalis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 31.

Eutania ornata YARROW, Reptilia U. S. Expl. W. of 100th Mer., V, pp. 550, 553; Check-list N. Amer. Batr. Rept., Bull. U. S. Nat. Mus., No. 24, 1883, p. 122; not of Baird and Girard.

This subspecies is quite distinct in appearance from the *E. s. sirtalis* in life, and may be also readily distinguished in spirits after the disappearance of the bright red colors. It has also a definite geographical range.

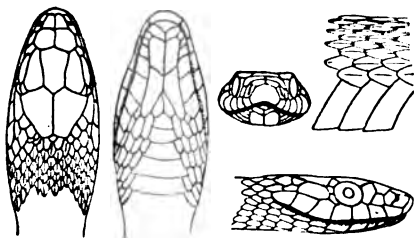


Fig. 303.

EUTÆNIA SIRTALIS DORSALIS BAIRD AND GIRARD.

1.

Rio Grande River, New Mexico, San Ildefonso.

Cat. No. 8738, U.S.N.M.

Form more slender than in the *E. s. sirtalis*; head quite distinct. Squamation identical with that of *E. s. sirtalis*. Gastrosteges (of Cat. No. 8738), one hundred and sixty-seven; anal, one; urosteges, eighty-eight. In Cat. No. 8737, gastrosteges, one hundred and sixty-two; anal, one; urosteges, eighty-five. Relative length of tail in Cat. No. 8738 (2 specimens),

three and seven-eighths times in total length; in Cat. No. 8737, four and one-eighth.

Measurements.—Total length, 576 mm.; length of tail, 145 mm.

Lower surfaces and lateral stripe olivaceous; gastrosteges with a small black spot near each end. Dorsal stripe red, with a delicate black or deep brown border on each side. Space between dorsal and lateral stripes brown, marked with a single series of small black spots, which occupy parts of three rows of scales next to the lateral stripe, and do not, therefore, reach the dorsal stripe. Spaces between the lateral spots red.

The gastrostegal spots are smaller than in the *E. s. sirtalis*, and are more isolated and rounded; sometimes they are not present on some of the gastrosteges. The labial plates are very little or not at all black-bordered. Parietal spots distinct.

The range of this subspecies is the same as that of the *E. elegans mariana*, namely, the drainage basin of the Rio Grande. The locality, "Platte River," given by Yarrow, requires confirmation. Other localities given by the same author are erroneous.

Eutania sirtalis dorsalis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8739	1	San Ildefonso, New Mexico.	Aug. —, 1874	Dr. H. C. Yarrow	Alcoholic.
8423	1	do	Aug. —, 1874	Cope, Yarrow, and Shedd.	do.
8738	2	do	Aug. —, 1874	Dr. H. C. Yarrow	do.
8740	1	do	Aug. —, 1874	William G. Shedd	do.
8737	3	New Mexico	Aug. —, 1874	Dr. O. Loew	do.
938	1	Portland, Oregon		Lieutenant Williamson ..	do.
960	1	Albuquerque, New Mexico.		A. Möllhausen	do.
977	1	San Pedro, Texas			do.
892	1	Platte River			do.
5378	3	!			do.
22143-5	.....	Las Cruces, New Mexico, Experiment Station.		T. D. A. Cockerell	do.

EUTANIA SIRTALIS PARIETALIS Say.

Eutania sirtalis parietalis COPE, in Yarrow's Reptilia U. S. Geog. Surv. W. 100th Mer., V, 1875, p. 546; Proc. U. S. Nat. Mus., XIV, 1892, p. 665.

Coluber parietalis SAY, Long's Exped. Rocky Mts., I, 1823, p. 186.—HARLAN, Jour. Acad. Nat. Sci. Phila., V, 1827, p. 349.

Eutania parietalis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1852, p. 28.

Eutania pickeringii COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 21; Check-list N. Amer. Batr. Rept., 1875, p. 41.

Eutania ornata BAIRD and GIRARD, U. S. Mex. Bound. Survey, II, Reptiles, 1859, p. 16, pl. IX.

Above light-olive brown; beneath slate color. Longitudinal stripes greenish. Spaces about and between the dark spots on the sides, brick red, these colors belonging to the skin, not to the scales.

Above dark olive, beneath light-slate color, except the inferior surface of the head, which is yellowish white. A broad longitudinal dorsal line of one and two half rows of scales, and an equally distinct one on each side on the second and third dorsal rows, of a greenish slate. The sides of the abdomen and the exterior dorsal row are dark-slate brown. When the skin is stretched, there are seen on each side, between the dorsal and lateral rows, two rows of quadrate black blotches, the first quite distinct, between the third and sixth rows; the second between the sixth and vertebral line, the spots confluent above with each other; the blotches about one scale apart. The intervals between the blotches of a vivid brick red, which color, as well as the black, is sometimes seen on the bases of the adjoining scales. None of the short white lines of *E. sirtalis* are visible. More or less of white on the inferior surface of the tail. No spots on end of gastrosteges.

The color when living, as described by Say, is dark-brown above, beneath bluish green, head beneath white. A vertebral greenish yellow line, and a lateral pale-yellow one; about eighty concealed red spots or semifasciae on the skin and lateral margin of the scales.

In twenty-two specimens in which the length of the tail was examined, the following results were obtained. Four and three-quarters times in total length, 4; four and one-half times, 1; four and one-third, 2; four and one-fifth, 1; four and one-tenth, 4; four and one-twelfth, 1; four and one-fifteenth, 1; four, 3; three and seven-eighths, 1; three and six-sevenths, 1; three and five-sixths, 1; three and six-sevenths, 1.

Variations in color exist which connect the *E. s. parietalis* with several other subspecies. Thus in Cat. Nos. 954 and 7798 the superior row of spots is obsolete on the posterior two-thirds of the length and the dorsal stripe is bordered by a narrow black line, thus approaching the *E. s. dorsalis*. In Cat. Nos. 664 and 4775, both from Kansas, and a specimen in my private collection from Fort Harker, Kansas, the spots of the superior row are distinct, and not confluent into a band. This form differs from the *E. s. sirtalis* only in having the spaces between the spots red instead of olive brown or green. Cat. No. 8374 has the same

character. In some specimens from Oregon the red spaces between the spots of the inferior row are very much contracted, and in some nearly closed, with black, thus approaching most closely the form *E. s. trilineata* of the Pacific coast. Finally, in four specimens from California there are eight superior labials, regularly arranged. In two of

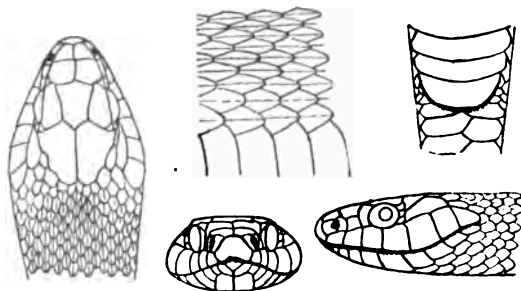


Fig. 304.

EUTANIA SIRTALIS PARIETALIS SAY.

= 1.

Fresno, California.

Cat. No. 12576, U.S.N.M.

these, from San Francisco (Cat. Nos. 865, 893), the confluence of the spots of the superior row with each other and with those of the lower row is imperfect, and on the hinder part of the length nonexistent. In the others (Cat. Nos. 864, 896) the colors on the posterior half of the body are arranged as in *E. s. dorsalis*, the anterior half conforming to the definition of the *E. s. parietalis*.

This subspecies represents the *E. s. sirtalis* in the central region of North America, which it completely replaces. It is the most abundant species of the northern parts of the Pacific region, ranging from Walla Walla to the coast, and as far south as Fresno, California. On the coast proper it is associated with three other subspecies. Its habits are semiaquatic. I have seen it in large numbers on the shores of the lakes of Oregon, where it lies in wait for frogs, toads, etc. It haunts the high grass of the creeks and rivers of the great plains, in which it quickly glides when pursued.

Mr. S. N. Rhoads, in his exploration in British Columbia in 1892, obtained three specimens from Hatzic, two from Sicamoo, British

Columbia, and one from Nelson and Vernon, British Columbia, respectively. Constant to its characters in the interior, but the three specimens from Hatzic show an approach to the *trilineata* form. This is produced by a diminution in the size of the red spots anteriorly, and their obliteration on the posterior part of the body and on the tail.

Eutamias sirtalis parietalis Say.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
871	1	Yellowstone River		Dr. F. V. Hayden	Alcoholic.
11722	6	Camp 12, Nevada	July —, 1867	Robert Ridgway	do.
10636	1	Fort Walla Walla, Washington.	—, 1880	Capt. Chas. Bendire, U. S. A.	do.
10635	1	do	—, 1880	do.	do.
10916	8	do	June —, 1881	do.	do.
900	2	California		Lieut. R. S. Williamson, U. S. A.	do.
870	2	Fort Benton, Missouri			do.
8069	2	(?)			do.
11752	1	Fresno, California		G. Eisen	do.
12576	1	do		do.	do.
8588	1	Lake Tahoe, Nevada		H. W. Henshaw	do.
960	1	El Paso, Texas		Col. J. D. Graham, U. S. A.	Alcoholic type.
898	1	California		R. D. Cutts	Alcoholic.
870	1	Fort Benton, Missouri		Lieut. G. Warren, U. S. A.	do.
664	1	Republican River, Missouri.		Lieut. F. T. Bryan, U. S. A.	do.
954	1	Salt Lake City, Utah		J. S. Bowman	do.
929	1	38° latitude, Utah		Lieut. E. G. Beckwith, U. S. A.	do.
979	1	Canoe Creek Valley, California.		Governor Stevens	do.
900	2	California		Lieut. R. S. Williamson, U. S. A.	do.
864	1	Tomales Bay, California		E. Samuels	do.
5492	1	Bitterwood Valley		E. E. Howell	do.
955	2	Shoalwater Bay, Oregon		Governor Stevens	do.
930	1	Rinconado, Mexico		Lieutenant Couch, U. S. A.	do.
940	1	Fort Dallas, Oregon		Governor Stevens	do.
978	1	Fort Snelling, Minnesota		do.	do.
5279	2	Puget Sound, Oregon			do.
4662	2	Fort Laramie, Wyoming			do.
9603	1	Milk River, Montana	—, 1873	Dr. E. Coues, U. S. A.	do.
9504	1	do	—, 1873	do.	do.
8585	2	Lake Tahoe, Nevada	—, 1878	H. W. Henshaw	do.
9564	1	California	—, 1877	do.	do.
10639	1	Fort Walla Walla, Washington.	—, 1880	Capt. Chas. Bendire, U. S. A.	do.
10634	1	do	—, 1880	do.	do.
10637	1	do	—, 1880	do.	do.
10638	1	do	—, 1880	do.	do.
10916	1	do	June —, 1881	do.	Adults and young.
10839	1	Des Chutes River, Oregon.	Sept. 10, 1878	H. W. Henshaw	Alcoholic.
10841	1	do	do	do.	do.
10842	1	Oregon	Sept. —, 1878	do.	do.
10851	1	Camp Bidwell, California.	July —, 1878	do.	do.
10909	1	Fort Walla Walla, Washington.	June —, 1881	Capt. Chas. Bendire, U. S. A.	do.
10910	1	do	do	do.	do.
11721	3	Truckee River, Nevada.	July —, 1867	R. Ridgway	do.
902	2	California		United States Exploring Expedition.	do.
11893	1	Des Chutes River, Oregon.		H. W. Henshaw	do.
11724	1	Camp 12, Nevada		R. Ridgway	do.
8370	1	(?)		Lieut. W. L. Carpenter	do.
10810	1	Southern Oregon		H. W. Henshaw	do.
11774	3	Fresno, California		G. Eisen	do.
9102	3	Fort Crook, California		J. Fellner	do.
17566-7	—	Swan River, near Swan Lake, Montana.		U. S. Fish Commission	do.
15431-6	—	Fort Klamath, Oregon		Dr. J. C. Merrill	do.
20935	—	Little Spokane River, Washington.		B. A. Bean	do.
22395	—	Vancouver Island, British Columbia.		John Macoun	do.
22407	—	Donald, British Columbia.		do.	do.

EUTÆNIA SIRTALIS TETRATÆNIA Cope.

Eutænia sirtalis tetratænia YARROW, Report Reptiles U. S. Geog. Surv. W. of 100th Mer., V, 1875, p. 516.

Length of tail entering the total length four and one-fifth times. The superior labials eight, the anterior rather crowded, so that it may be the normal number is seven instead of eight, in which case this form should be referred to the *E. sirtalis* rather than to the *E. infernalis*. The loreal is as high as long, and the temporals are 1-2-3. The frontal wider than the superciliaries, and does not reach the preocular. The postgeneials are longer than the pregeneials. Gastrosteges, one hundred and fifty-eight; urosteges, sixty-eight.

Measurements.—Total length, 800 mm.; length of tail (tip lost), 118 mm.

The ground color is seen in the dorsal stripe and in the belly as high as the third row of scales, inclusive. This is bluish olivaceous. The scales mentioned are black at their bases and on their adjacent edges, and in the first row of scales the black covers the angular extremity of the gastrosteges. No regular spots on the gastrosteges, as in most subspecies of *E. sirtalis*. There is no distinct lateral stripe. The dorsal stripe covers one and two half rows of scales. Externally on each side it is bounded by a black stripe, which also covers one and two half rows of scales, and which

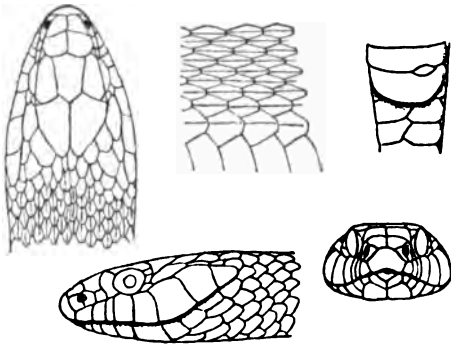


Fig. 305.

EUTÆNIA SIRTALIS TETRATÆNIA COPE.

= 1.

Pitt River, California.

Cat. No. 866, U.S.N.M.

extends to the base of the tail. Exterior to this on each side is a red stripe, which also covers one and two half rows of scales. Exterior to this on each side is a second black stripe on each side, which covers one and a half rows of scales, and extends to the base of the tail, beyond which it is broken up into a series of black spots. It is also broken up into spots for a short distance posterior to the head. These spots have no connection with the superior black band. Head olive gray, with two pale parietal spots; no nuchal spots. Superior labials with narrow black posterior borders on the fourth, fifth, and sixth. Throat and chin yellowish, unspotted; no black marks on middle of belly and tail below.

The color pattern of this subspecies is entirely different from that of any other, and is the result of a confluence of the spots, one phase of which is seen in the *E. sirtalis concinna*. As in that form, the inferior row of spots has become a longitudinal band; but, unlike that form, the red spaces between the superior row of spots has also become a stripe, instead of remaining separate.

Eutania sirtalis tetratania Cope.

Catalogue No.	Number of specimens.	Locality.	Whence obtained.	Remarks.
866 (1)	2 1	Pitt River, California..... Puget Sound, Washington..	f..... f.....	Alcoholic. do.

EUTÆNIA SIRTALIS CONCINNA Hallowell.

Eutania sirtalis concinna COPE, Proc. U. S. Nat. Mus., XIV, p. 664.

Eutania concinna COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 23.

Eutania concinna BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 146.

Tropidonotus concinnus HALLOWELL, Proc. Acad. Nat. Sci. Phila., VI, 1852, p. 182.

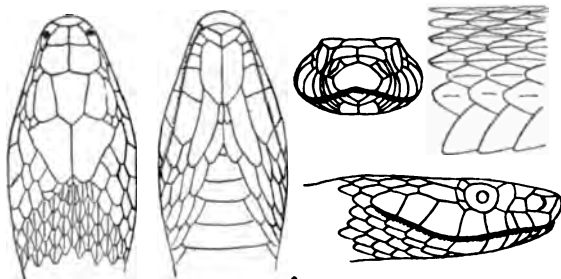


Fig. 866.

EUTÆNIA SIRTALIS CONCINNA HALLOWELL.

=1.

Western Oregon.

Cat. No. 10907, U.S.N.M.

Head small; body rather stout. Black, with a dorsal light stripe, and the usual two rows of lateral spots and stripe replaced by a single series of distinct salmon-colored spots.

Above, intense black, with a dorsal greenish white line one and two half scales wide, and extending from head to tip of tail. On each side is a series of vertically elongated distinct spots of a reddish salmon color, and seventy-five in number between the head and anus. They occur on the second to the sixth rows of scales, and are half a scale long, the same color being visible on the adjoining skin. The dark intervals are one scale longer than the spots themselves. Beneath, greenish black, tinged with white anteriorly. Whole head reddish yellow, tinged above with brown.

This subspecies carries the fusion of colors further than the *E. s. parietalis*, since the belly is black. This color joins that of the inferior series of black spots, and as the superior series are confluent, the intervals between the former are isolated.

The tail in the only specimen where it is complete is one-fourth the total length. Gastrosteges, 163; urosteges, 85.

Measurements.—Length, 650 mm; tail, 187 mm.

I took a specimen of this form alive at Eugene, Oregon. The muzzle,

throat, and lips, as well as the lateral vertical bars were of a vermillion red.

Eutania sirtalis concinna Hallowell.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
944	1	Fort Vancouver, Oregon....	.....	Alcoholic.
10807	1	Western Oregon.....	H. W. Henshaw	do.

Baird and Girard give the number of rows of scales as twenty-one, but in the three specimens at my disposal they are in nineteen rows.

EUTÆNIA SIRTALIS PICKERINGII Baird and Girard.

Eutania sirtalis pickeringii COPE in Yarrow's Rept., U. S. Geog. Surv. W. 100th Mer. V, p. 546.

Eutania pickeringii BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serpents, 1853, p. 27.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 41.

In this subspecies melanism is carried further than in any of the others. The typical specimen is of an intense black, tinged with bluish

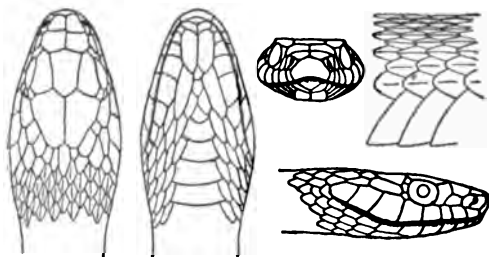


Fig. 807.

EUTÆNIA SIRTALIS PICKERINGII BAIRD AND GIRARD.

= 1.

Puget Sound, Washington.

Cat. No. 9336, U.S.N.M.

below. There is a very narrow greenish white vertebral line, beginning at the nape, where it occupies one and two half scales, and gradually narrows to the carina of the middle dorsal row, becoming obsolete at the anus. The carinae of the second and third rows of exterior dorsal scales show the faint line of greenish white, only perceptible on close observation. The

lores, labials, cheeks, and head beneath, greenish white, gradually shading into the blue-black of the abdomen at or about the anterior fifth. Scuta, 158-1-73.

Measurements.—Length, 656 mm.; tail, 162 mm. In the specimens the tail is longer than in the average of the *E. s. sirtalis*, namely: Cat. No. 9336 (1) three and four-sevenths in the total length; (2) three and three-fourths times.

Eutania sirtalis pickeringii Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
9336	2	Puget Sound, Washington..	U. S. Exploring Expedition.	Alcoholic.
5279	2	do.....	do.....	do.

In another specimen, Cat. No. 5279, with the general color very dark, the vertebral line occupies one and two half scales throughout. The black on each side appears formed by the confluence above of about seventy-six spots from head to anus, each spot from one and one-half to two scales long. In other words, there is a stripe of black three and one-half scales wide on each side of the vertebral line, confluent with which is a series of black spots on each side, as indicated. The lateral stripe is on the second lateral row of scales, of a greenish white color, and confluent with the intervals of the spots, also of the same color. The stripe is not well defined, but swells and narrows like a knotted cord. Exterior row of dorsal scales and sides of abdomen deep blue-black, becoming greenish toward the middle of the abdomen; anteriorly the color shows more white. The intervals between the lateral spots are very narrow, and anteriorly are wanting, producing the coloration of the *E. s. trilineata*. Scuta, 170-186.

Measurements.—Length, 450 mm.; tail, 112 mm.

EUTÆNIA SIRTALIS TRILINEATA Cope.

Eutania sirtalis trilineata COPE, Proc. U. S. Nat. Mus., XIV, 1892, pp. 662, 665; Proc. Acad. Nat. Sci. Phila., 1893, p. 182.

Color above, black with three light-blue longitudinal stripes. The dorsal stripe occupies the median row of scales and half a row on each side of it, and the lateral stripe occupies the second row with half of the third, and is accompanied by a row of blue spots, one on each scale of the first row. Belly lead colored except the lateral extremities of the gastrosteges, which are black. Top of head and temporal scales black, without parietal spots. Sides of head, except parietal plates, light blue, the superior labials with black border above in front of the eye and behind posterior to the eye. Chin and throat light yellow, the color passing through greenish to blue to the lead color of the belly. Tail lighter lead colored below.

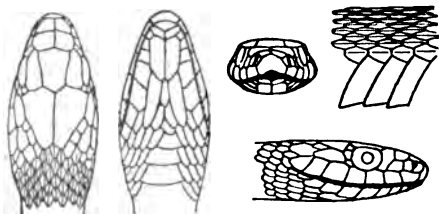


Fig. 308.

EUTÆNIA SIRTALIS TRILINEATA COPE.

= 1.

Washington State.

Cat. No. 5275, U.S.N.M.

This form has the colors of the *E. s. pickeringii* distributed as in the *E. s. obscura*. Three specimens are known to me. The scuta are 157-168.

Measurements.—Total length, 530 mm.; tail, 123 mm.

Four specimens, two from Tacoma, and one each from Hatzig and Sicamoos, British Columbia, were obtained by Mr. S. N. Rhoads. The last two specimens are typical *E. s. trilineata*, but in the two from Tacoma the dorsal stripe marks only a single row of scales, and the

lateral is principally on one row, and partly on another. It is not unlikely that the two subspecies, *E. s. pickeringii* and *E. s. trilineata*, may have to be united.

Eutania sirtalis trilineata Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
5275	1	Port Townsend, Washington.	Lieutenant White	Alcoholic
5493	4	Fort Benton, Montana	Lieutenant Mullan	do.

A fifth specimen (Cat. No. 5493), from Fort Benton, Montana, is absolutely black, with throat and edge of upper lip yellowish.

EUTÆNIA NIGRILATUS Brown.

Eutania nigrilatus COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 665.

Eutania nigrilateris BROWN, Proc. Acad. Nat. Sci. Phila., 1889, p. 421.

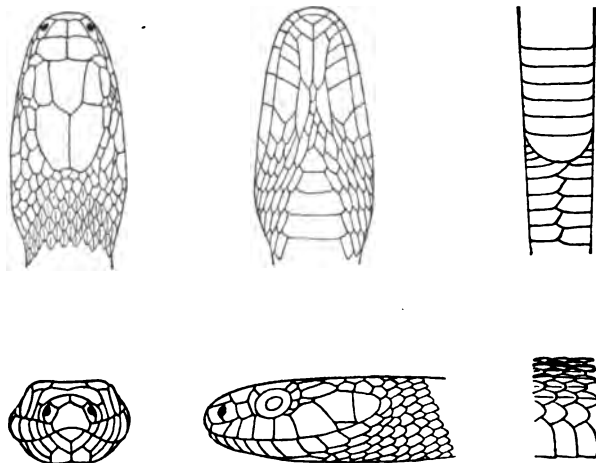


Fig. 309.

EUTÆNIA NIGRILATUS BROWN.

= 1.

Tucson, Arizona.

Type in Museum Academy of Natural Sciences, Philadelphia.

Form moderately stout, about as in *E. sirtalis*. Tail short. Head short and broad, flattened on crown. Frontal and occipitals short and broad; superciliaries short in front; one anteorbital, much elevated and pointed above, in contact with the fronto-external angle of the frontal; three postorbitals, the lower one lying on the fifth and sixth superior labials; upper labials eight, sixth and seventh largest; lower labials ten, sixth largest. Eye rather large, center just behind the suture between the fourth and fifth labials. A vertical series of three temporals in contact with the postorbitals, the lower one small and lying on the sixth and seventh labials, but mainly on the sixth; the middle one

above and behind it is much larger and elongated; the upper one, somewhat smaller than the last, is in contact with the occipitals. On one side in this specimen the large middle temporal is divided into two portions, the anterior being the smaller. Two scales in second row on both sides.

Twenty-one dorsal rows of scales, the outer one but little larger than the second, the former smooth anteriorly, faintly carinated toward the tail; carinæ on the remaining rows increasing toward the dorsal line.

A golden yellow stripe occupies the median row of scales from nape to tip of tail, widening slightly on the edges of the contiguous rows at the anterior end; a lateral stripe of same color very indistinct anteriorly, where it is mostly confined to the third row, but better defined on the posterior third of the body, where it invades the upper half of the second. Color above the laterals brownish olive with two series of alternating dark spots (sixty-six pairs in this specimen from head to anus), the lower series on the fourth, fifth, and sixth rows, the upper on the seventh, eighth, and ninth; below the lateral lines, the first and lower half of the second rows (anteriorly, occasionally to the lower half of the third) with the ends of the abdominal scutellæ, are lustrous pitch-black. The upper surface of the head in front of the occipitals is greenish olive; behind that, to the neck and the sides of the head, including the seventh and eighth superior labials, blackish brown, slightly maculated with dull chestnut just behind the occipitals, the dorsal yellow line being slightly indicated on the dark patch. Beneath white, with a creamy tinge anteriorly, becoming pale greenish on the subcaudals. The labials are margined with blackish brown; a post-oral cream-colored crescent with the concave side forward; a similar band passing down on the postorbitals widens on the sixth upper labial and runs into the throat color, and a third light band is indicated on the anteorbital, becoming lost on the fourth upper labial. Iris bright copper color. Scuta, 156-1-63.

Measurements.—Total length, 510 mm.; length of tail, 110 mm.

The general affinity of the species is to the *E. elegans marciana*, since when the epidermis is removed the spots have much the same character. It is especially characterized by the large number of temporal scales of the first row, which are more numerous than in any other species of the genus. The contact of the preocular and frontal plates is also uncommon. The broad black lateral band is characteristic.

The only specimen known was taken near Tucson, Arizona, and was sent to the zoological garden of Philadelphia by Mr. Herbert Brown. During life it was of an aggressive disposition, like several other species of the genus. It is now in the museum of the Philadelphia Academy of Natural Sciences.

EUTÆNIA MELANOGASTER Wiegmann.

Eutenia melanogaster COPE, Proc. Amer. Phil. Soc., 1885, p. 386.

Tropidonotus melanogaster WIEGMANN, Preisverzeichniss der Säugeth., Vögel, Amphib., Fische u. Krebse, von Herrn Deppé u. Schiede in Mexico ges., Berlin, 1830, No. 167 (*nomen nudum*).—CABANIS, Journ. f. Ornithologie, 1863, p. 54 (*nomen nudum*).—PETERS, Monatsb., Berlin. Akad., 1864, p. 389.—BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 225.

Form rather robust; head little, distinct from the body. Tail entering total length four and a quarter times. Scales keeled, except those of the second and first rows, which are about as deep as long. The scales are all rather wide, graduating from the first and second rows. Scales of the tail with one or two tubercular serrations of the keels. Frontal plate rather narrow, but wider than the superciliaries. Parietals rather short. Loreal longer than high; oculars, 2-3; temporals, 1-2-3 or 2.

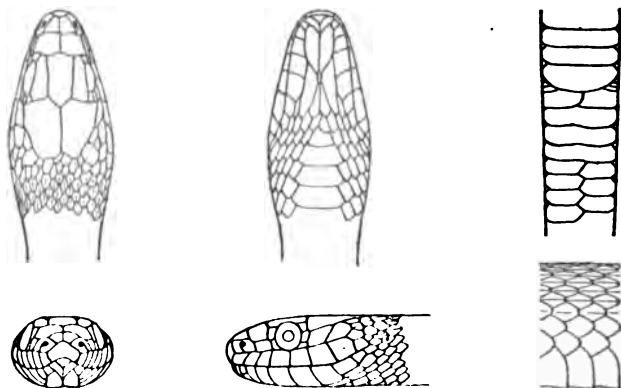


Fig. 310.

EUTÆNIA MELANOGASTER WIEGMANN.

=1.

Lake Xochimilco, Mexico.

Collection of E. D. Cope.

Superior labials subquadrate, except anterior three, which are higher than long. Geniials moderate, subequal. Scuta, 152-1-65. The last pair of urosteges form a shoe-like spine at the end of the tail.

Color dark brown above with a trace of a lateral stripe of a paler brown on the second and third rows of scales. The first row is darker, and with the tips of the gastrosteges the bases are black. Below yellowish-olive brown, darker posteriorly; the middles of the scuta and scutellæ black, this color narrowing anteriorly and terminating behind the throat. Throat greenish yellow; superior labials similar but browner.

Measurements.—Total length, 494 mm.; of tail, 115 mm.; the specimen rather small.

The *E. melanogaster* is one of the few species of the genus which does not possess bands. However, in one specimen I observed a faint trace of a lateral band on each side. It is also variable as to the number of

its ocular plates, having them 2-2, 2-3, 1-3, or 2-4, 2-3 being apparently the most common arrangement. The food of both these species is the *Rana montezumæ* Baird, and another species allied to *R. halecina*. The life of this lake is in other directions exceedingly prolific, especially in fishes and in minute Crustacea.

I am indebted to my excellent friend, Dr. Julius Flohr, of the city of Mexico, for a canoe excursion on the lake Xochimilco, which is 17 miles from the city, in the valley of Mexico. Here I had an opportunity of seeing the botany and zoology of the very irregular shores, which are so curiously constructed by the art of the natives. The shores are indented in the form of long, narrow docks, and extended in the form of piers into the waters of the lake. The ends of these piers are sometimes more or less detached below, so as to be readily moved, from which the later statements regarding the floating islands have originated. The piers are planted with crops of vegetables or flowers, which are sold in the adjacent city.

The ends and shores of the piers are the resting place of innumerable water snakes, which can be readily observed from a canoe. The wife of our Indian boatman was particularly acute in detecting these animals before either my friend or myself could see them. We caught a considerable number, and found that they belong to the two species above named. The habits of the two differ somewhat. The *E. macrostemma* is the more active, sooner seeking the water, where it swims, keeping close to the shore, and remaining more or less in sight until it conceals itself in a hole. The *E. melanogaster*, on the other hand, lies quietly so as to be more easily taken in the hand; but, if it once takes to the water, it seeks the depths and is no more seen. It is much less disposed to bite than the *E. macrostemma*; the latter being, like its ally, the *E. sirtalis*, a very pugnacious snake.

EUTÆNIA MULTIMACULATA Cope.

Eutænia multimaculata COPE, Proc. Amer. Phil. Soc., 1885, p. 284; Proc. U. S. Nat. Mus., XIV, 1892, p. 665.

Atomarchus multimaculatus COPE, American Naturalist, 1883, p. 1300.

Tropidonotus multimaculatus BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 214.

Teeth isodont. Scales in twenty-one rows, all keeled excepting the inferior one. Superior labials eight, all low and rather long, the orbit bounded by the fourth, and cut off from the fifth by the inferior postocular. Loreal low, much longer than high. Preoculars two, both subquadrate, the superior the larger, the inferior resting on the fourth superior labial. Postoculars three, the median the smallest (the apex of the inferior cut off to form a fourth on one side). Temporals 1-3, the anterior large, bounding the sixth and seventh labials above. Rostral not prominent, wider than deep, truncate above. Internasals longer than wide, rarely separated in front, and from the rostral by a pentagonal zygous plate. Frontal narrow with concave sides, the ante-

rior angles touching the superior preoculars. Superciliary plates convex, subtriangular, and nearly acute in front. Parietals elongate, posteriorly acute, and much divaricate. Muzzle quite narrow, eyes directed laterally.

Color above ash gray, with six or seven longitudinal series of brown spots. Those of the median two or three rows are sometimes united, forming short crossbars. Those of the inferior series are on the first row of scales and are blacker than the others. Below creamy ashen, with irregular black blotches on the anterior part of each scutum. Tail nearly uniform ash above and below, excepting a blackish line along the junction of the scutellæ. Throat yellow; inferior labials yellow with blackish posterior borders; superior labials less bright yellow with brown posterior and superior borders. Top of head brown, with darker brown markings as follows: A dark shade in the middle of each

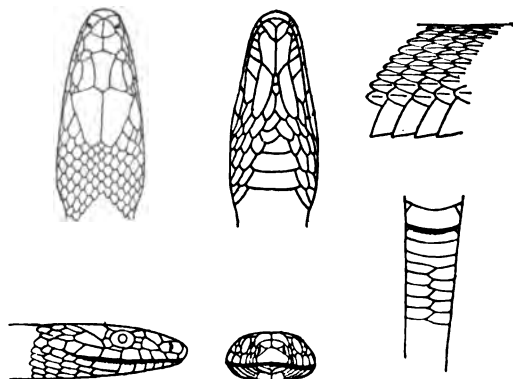


Fig. 311.

EUTÆNIA MULTIMACULATA COPE.

= 1.

Chihuahua, Mexico.

Cat. No. 14971, U.S.N.M.

parietal; a narrow X opening forward on the frontal; a longitudinal line on each superciliary, and a transverse waved line across each prefrontal.

The above description is taken from the typical specimen which I caught in the San Francisco River, which is one of the head tributaries of the Gila, in southwestern New Mexico. Subsequently the National Museum received numerous specimens from near the city of Chihuahua, Mexico, where it is evi-

dently abundant. The specimens display a remarkable variability in coloration, and also prove that the azygous plate which exists between the prenasal plates of the typical specimen, is an abnormality. In one of the Chihuahua specimens there is an azygous plate between the internasals, which is of shorter form than in the type; while in another there is an azygous plate between the prefrontals. In all of the others azygous plates are wanting. The ocular plates are normally 3-3, but the following variations occur: 2-3-2-3, one; 2-3-3-3, one; 2-2-3-3, one. The loreal is normally quite elongate; in one specimen it is shortened. The color varies from uniform brown above, to spotted in two styles. In one of these there are seven rows of brown spots with paler or rufous centers; in the other the brown borders of the spots have disappeared, and the rusty centers are represented by small rusty orange spots. The under surfaces are yellow, the gastrosteges with

dark shading at the ends. In young specimens the head is more or less marked with obscure blackish marks. This species is distinguished by its long compressed muzzle, as well as by its peculiarities of squamation.

The only specimen of this species which I have seen living was taken in a seine net with which I was fishing near the bank of the San Francisco River. It dove into the net, seeking the bottom of the water as a place of concealment, as is the habit of the *E. melanogaster*, and contrary to that of the *E. saurita* and *E. macrostemma*, which swim preferably on the surface, seeking concealment under the banks.

Eutania multimaculata Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
14271	10	Chihuahua, Mexico.	Edward Wilkinson.....	Alcoholic.

EUTÆNIA RUFOPUNCTATA Cope.

Chilopoma rufopunctatum COPE in Yarrow, Rept. U. S. Expl. Surv. W. of 100th Mer., V, 1875, p. 544.

Stypocemus rufopunctatus COPE, Proc. Amer. Phil. Soc., 1885, p. 387.

Tropidonotus rufopunctatus BOULENGER, Cat. Snakes Brit. Mus., I, 1893, p. 214.

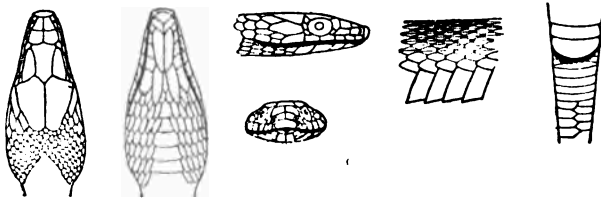


Fig. 312.

EUTÆNIA RUFOPUNCTATA COPE.

× 1.5.

Type.

Southern Arizona.

Cat. No. 8600, U.S.N.M.

Rostral plate turned over on the superior face of the muzzle, and with a truncate posterior border; the transverse extent three times the length. Internasals a little longer than wide; the prefrontals decurved laterally. Nasal long and rather narrow, slightly recurved on the upper face of the muzzle in front. Loreal elongate, and with convex superior border, passing partly below the superior part of the preocular. Preocular higher than wide, in contact with frontal. The latter plate elongate and obtuse behind, wider than superciliaries. Parietals elongate. Temporals 1-4, the anterior large, bounding the sixth and seventh superior labials. Postoculars three. Superior labials eight, all longer than deep, the last small; the fourth and fifth bounding the orbit below; the sixth and seventh bounded by the anterior temporal above. Nine infe-

rior labials; geneials elongate, the pair subequal. The head is an elongate oval, narrowed anteriorly, and quite distinct from the neck. The tail is one-fourth the total length. Scales in twenty-one longitudinal rows, all strongly keeled except the first and second on each side; all poreless. Gastrostege one hundred and seventy-seven; urostege entire, four; divided, thirty-three.

General color above light brown, olive shaded on the head. The anterior half of the body is marked with six rows of small alternating bright rufous or orange spots, each of which occupies one, and sometimes an adjoining scale. They stand on the first and second, the fifth, and on the eighth rows, respectively. On the posterior third of the length they are wanting, and are indistinct posterior to the middle of the length. The lower surfaces are pale brownish gray; the base of each gastrostege with blackish markings. Labial plates light; head without spots. There is an inferior preocular higher than long on one side of this specimen.

This species is nearly related to the *E. multimaculata*, and better specimens may prove them to be identical. However, there is a constant difference in the shape of the rostral plate, which has the form usual in *Eutania* in the *E. multimaculata*, while it is so peculiar in the present species as to have given ground for its separation in a distinct genus. This plate is obliquely truncated laterally and produced posteriorly at the middle of the posterior border, in the *E. multimaculata*; while it is low and truncate posteriorly, having a transversely ovate form in the *E. rufopunctata*. Its border is slightly free all round in the latter, which it is not in the former; but this appearance may be a result of drying, though I do not see exactly how it can have so arisen. This species further differs from the *E. multimaculata* in the two superior labials entering the orbit; in the rather more elongate internasals and prefrontals; in the more posteriorly-produced loreal, and in the superior labials, of which the third nearly enters the orbit. However, some specimens of the *E. multimaculata* approach it in one or the other of these respects, and the narrowness of the labials has been somewhat exaggerated by the partial drying to which the specimen has been subjected. To the same cause may be ascribed some errors in the original figure and description. Thus the nasal plates are not confluent, nor does the loreal plate quite enter the orbit as has been stated.¹ The figure omits the postocular plates, which were simply turned into the orbit by drying. The rostral plate is accurately represented.

Eutania rufopunctata Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
8600	1	Southern Arizona	H. W. Henshaw	Alcoholic.

¹ U. S. Geog. Survey, W. of 100th Mer., V, p. 543, pl. xx, fig. 1.

GLYPHODONTA.

This superfamily presents no such diversity of character as to indicate that it embraces more than one family, the Dipsadidæ. The subfamilies of the Dipsadidæ correspond quite closely with those of the Colubridæ. They are defined as follows:

I. Hypapophyses of vertebræ anterior only.

Hemipenis spinous.

Calyculate; sulcus undivided DIPSADINÆ

Calyculate; sulcus bifurcate SCYTALINÆ

Not calyculate; an apical disk ERYTHROLAMPRINÆ

II. Hypapophyses extending throughout column.

Not calyculate; no basal hook nor apical disk HOMALOPSINÆ

These subfamilies correspond with those of the Colubridæ, as follows:

Colubridæ.

Xenodontinæ.

Dromiciniæ.

Colubrinæ.

Lycodontinæ.

Dipsadidæ.

Erythrolamprinæ.

Scytalinæ.

Dipsadinæ.

Homalopsinæ.

The distribution of the subfamilies of corresponding pairs is nearly identical. Thus the first two of both columns are South American, and the third of both columns is nearly cosmopolitan. The fourth group of each column is nearly restricted to the African and Oriental regions. Still closer correspondences will be pointed out in the characters of some of the genera of corresponding subfamilies.

ERYTHROLAMPRINÆ.

In this subfamily the sulcus and hemipenis are bifurcate in the known genera.

I. Hemipenis generally spinous; disk at the extremity of the sulcus.

Coronelliform; scuta normal *Erythrolamprus* Boie

II. Hemipenis with spines in two bands only; disk at one side of the sulcus.

Attenuate; scuta normal; disk papillose; spines joined by a longitudinal membrane *Lygophis* Tschudi.

Neither of the above genera occur in the Medicolumbian region.

SCYTALINÆ.

I. Hemipenis transversely or obliquely plicate (divided). (Flabellati.)

No calyces; rostral plate normal *Jaltris* Cope.

Calyces at apex; rostral plate produced *Conophis* Peters.

II. Calyculate and not capitate. (Calyculati.)

α. Hemipenis divided.

Rostral recurved *Rhinostoma* Wagler.

Rostral normal; pupil erect *Oxyrhopus* Wagler.

Rostral normal; pupil round *Philodryas* Wagler.

αα. Hemipenis undivided.

Rostral normal *Thamnodryas* Wagler.

III. Capitata (also calyculate). (Capitati.)

Hemipenis undivided; colubriiform *Coniophanes* Hallowell.Hemipenis undivided; fusiform *Hydrocalamus* Cope.

α. Spinous to apex (divided). (Spinosi.)

Two nasal plates *Tachymenis* Wiegmann.One nasal plate *Tomodon* Duméril and Bibron.

IV. Bands of spines extending to apex. (Calycispinosi.)

Spines of bands minute; subcaudal scuta; one-rowed *Scytale* Wagler.

The groups into which this subfamily is divided correspond closely with those which are found in the subfamily Dromicinae. Group VI, including only the genus *Heterodon*, is the only one of the latter which is not represented in the former. Apart from penial characters, the genera of the corresponding groups sometimes resemble each other, but frequently they do not. Thus, *Alsophis* resembles *Philodryas*, and *Rhadinæa* resembles *Coniophanes*, and *Acanthophallus* resembles *Tomodon*, in general characters.

This subfamily is exclusively neotropical, with the exception that four species of the Central American subregion wander over the border into the Toltecan subregion, one of them extending to within the political boundaries of the United States at its extreme southern limit.

MANOLEPIS Cope.

Manolepis COPE, Proc. Amer. Phil. Soc., 1885, p. 76.—BOULENGER, Cat. Snakes Brit. Mus., III, 1896, p. 120.

Maxillary teeth equal anterior to the grooved teeth, which are enlarged; anterior mandibular teeth longer than posterior. Head distinct from neck; pupil vertical. Scales smooth, pitless. Nasal plate entire or semidivided. Anal and subcaudals divided.

This genus is allied to *Tomodon* Duméril and Bibron, but the pupil in that genus is round and the scales have apical pits. As all my specimens are females, I have been unable to learn the penial characters. But one species of *Manolepis* is certainly known, but discrepancies in the figures and descriptions of authors leave the question somewhat uncertain. The characters are briefly as follows:

Scales in nineteen rows. Frontal very narrow, three to four times as long as wide; light brown with a darker dorsal band *M. putnamii* Jan.

MANOLEPIS PUTNAMII Jan.

Manolepis putnamii BOULENGER, Cat. Snakes Brit. Mus., III, 1896, p. 120.

Dromicus putnamii JAN, Elenco Sistemático, 1863, p. 67; Icon. Gén. Ophid., Pt. 24, 1867, pl. VI, fig. 3.—GARMAN, N. Amer. Rept., 1883, pp. 59, 153.

Philodryas putnamii GÜNTHER, Biolog. Centr. Amer., Rept., 1895, p. 166.

Tomodon nasutus COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 160.—BOCOURT, Miss. Sci. Mex., Rept., 1886, p. 641.

Body cylindrical, stout; neck but little constricted; head acuminate, oval; muzzle produced beyond the labial margin, oblique, truncate in profile. Rostral plate flat, not turned backward above; wider than high. Both internasals and prefrontals longer than wide, the latter a

little bent down laterally. Frontal three to four times as long as least width; lateral outlines not straight. Supraoculars broad; occipitals rather short; longer than broad, the length equal that of the frontal; two unequal postoculars in contact with one temporal. One preocular just touching frontal; one longitudinal loreal, higher behind, frequently wanting. One elongate nasal, the nostril anterior to its middle and frequently connected by a suture to the margin below. Superior labials, eight; third, fourth, and fifth entering orbit; inferior, ten; five in contact with pregenials, which are longer than postgenials. Anterior maxillary and mandibular teeth longer than median. Pupil round. Scales broad, thin, poreless, in nineteen rows. Tail rather slender. Gastrosteges, 173-9¹; one divided anal; urosteges, 69-73.

Measurements.—End of muzzle to rictus oris, 13 mm.; total length, 582 mm.; tail, 112 mm.

General color light brown, punctulate with dark brown, especially thickly on head and sides. A darker brown band three and two half scales wide, from occiput to end of tail, which is nearly broken into spots on the nape. Ends of scuta and first two rows of scales darker, especially anteriorly where the band is sooty and spreads over the lips and chin; a faint longitudinal band above the shade; a short yellow, dark bordered streak from postorbitals to penultimate labial. Abdomen with many short punctulate streaks. With age the bands become more indistinct, so that nothing remains of the one on the dorsal region but its external borders.

Of the seven specimens at my disposal three have a loreal plate and four have none, its place being taken by the decurved prefrontal. In one specimen there are eight superior labials, the excess appearing in front of the line of the orbit.

In all of my specimens the frontal plate is relatively narrower than in the specimens figured by Jan, and described by Boulenger. Its least width enters the length from three to four times, while those authors give it as entering two and a half times.

Manolepis putnamii Jan.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
1341	2 3	Colima, Mexico Tehuantepec	John Xantus F. Sumichrast	Alcoholic. do.

According to Boulenger, the British Museum has received this species from La Cumbre de los Arrastrados, in the State of Jalisco, Mexico, from an elevation of 8,500 feet. This habitat brings it within the Medi-

¹ My original description gives the gastrosteges as one hundred and eighty-six, but in none of the five specimens at my disposal does the number exceed one hundred and seventy-nine. The former number is probably a misprint for one hundred and seventy-six.

columbian region, although the specimens in the U. S. National Museum are from the Tierra Caliente.

Sumichrast says of this species:

This serpent is peculiar to western Mexico. It is not common and is found especially in sandy regions, sometimes in the interior of the forest, sometimes on the borders of streams. Its extreme agility renders its capture difficult. Without being aquatic, it has the manners of the *Tropidonoti*, with which one is inclined to confound it on first sight, if the retracted muzzle did not give it an entirely peculiar expression.

I would add that the black color round the mouth and chin adds to its decidedly suspicious physiognomy.

There is some doubt as to the correct name of this species. The description of Jan in 1863 is scarcely sufficient to sustain his name, and in 1862 I described a species as *Liophis putnamii*—a species which belongs to the genus *Dromicus*. It was not, however, called *Dromicus putnamii* until after 1863.

CONOPHIS Peters.

Conophis PETERS, Monatsber. Berl. Akad. Wiss., 1860, p. 519.—COPE, Jour. Acad. Nat. Sci. Phila., 1875, p. 137.—BOULENGER, Cat. Snakes Brit. Mus., 2d ed., III, 1896, p. 122.

Elongated grooved tooth separated from others by an interspace. Hemipenis bifurcate, apex with a few calyces, between which and the spinous portion it is flounced. Rostral plate prominent, decurved, concave below. Scales smooth; anal and subcaudals divided. Nasals divided, nostril bordering internasal plate.

This genus holds a rather isolated position among American genera, but it is quite similar to and probably allied to the genus *Rhamphiophis* Peters, which inhabits the sandy parts of Africa. Both genera have the decurved muzzle and claw-like rostral plate, which is designed for scooping a cavity in the soil by a downward movement, as opposed to the upward movement usual in other snakes.

I. Seven upper labials.

α. Temporals in two rows; loreal higher than long.

Body without bands, but faint traces of them on first, third, and seventh rows of scales *C. lineaticeps* Cope.

Body banded on third and eighth rows; dorsal bands distinct. *C. vittatus* Peters.

II. Eight upper labials.

α. Two rows of temporals.

Loreal higher than long; six longitudinal bands, the lower on the first row of scales, two dorsal, none on the belly; head, brown, yellow banded. *C. pulcher* Cope.

Loreal long, or longer than high; no bands except short one from muzzle through eye *C. concolor* Cope.

αα. One row of temporals in front; large ones behind.

Loreal longer than high; bands on all the scales except those of the fifth row on each side *C. lineatus* Duméril and Bibron.

Of the above species the only one which extends its range to the Mexican plateau is the *C. vittatus*. The others belong to the Tierra

Caliente. *C. concolor* has been found thus far in Yucatan only, and *C. pulcher* in Mexico and Guatemala, while *C. lineatus* ranges to Panama. The habitat of *C. lineaticeps* (*C. vittatus*¹) is Guatemala (Capt. J. M. Dow).

CONOPHIS VITTATUS Peters.

Conophis vittatus PETERS, Monatsber. Akad. Wiss., Berlin, 1860, p. 519, fig. 3.—BOCOURT, Miss. Sci. Mex., Rept., 1886, p. 644, pl. xxxviii, fig. 7.—GÜNTHER, Biol. Centr. Amer. Rept., 1895, p. 165.—BOULENGER, Cat. Snakes Brit. Mus., 2d ed., III, 1896, p. 123.

Conophis sumichrastii COPE, Jour. Acad. Nat. Sci. Phila., 1875, p. 137.

Dorsal surface gray, brown, or bluish white; three longitudinal dark-brown stripes or bands originate at the muzzle, of which the two lateral pass through the eye and along the sides of the body to the end of the tail. The median stripe divides into two on the nape and continues separate to the end of the tail. Two nasal shields, one frenal, one preorbital; two postorbitals; seven supralabials, of which the third and fourth are in contact with the eye; between the fifth and sixth and the parietals two long temporals; above the seventh, three; then more rows of temporal shields. Nine infralabials, of which the first is in contact, behind the mental, with its fellow of the opposite side, and the pentagonal fifth largest; two pairs of submentalia, of which the anterior is the larger. Dorsal scales rhomboidal, larger at sides, in nineteen longitudinal rows. Gastrosteges, according to Boulenger, 147-163; urosteges, 57-70 pairs.

There are three forms, probably subspecies of the *C. vittatus*, which differ as follows:

Three dorsal stripes; median five scales and lateral four scales wide.

C. v. videns Cope.

Four dorsal stripes, each one and two half-scales wide; frontal plate twice as long as wide and equal length of muzzle in front of it; temporals 2-3.

C. v. vittatus Peters.

Stripes as in *C. v. vittatus*; frontal plate 2.5 times as long as wide and longer than muzzle in front of it; temporals 3-3 *C. v. sumichrastii* Cope.

Of these subspecies the U. S. National Museum possesses one specimen of the *C. v. videns* from Tehuantepec, from F. Sumichrast; four of the *C. v. vittatus* from Colina, from J. Xantus, and one from Tehuantepec, from Sumichrast; and one of the *C. v. sumichrastii* from Guadalajara, from J. J. Major.

CONOPHIS VITTATUS SUMICHRASTII Cope.

Conophis sumichrastii COPE, Jour. Acad. Nat. Sci. Phila., 1875, p. 137.

While this form resembles the typical subspecies in coloration, the form of the head and of its plates differs considerably. The muzzle is narrower, so that the prefrontals have a relatively greater anteroposterior extent. The greater relative elongation is seen in the frontal plate as shown in the diagnosis, an elongation in which the supraoculars

¹ Cope, Jour. Acad. Nat. Sci. Phila. (2), VIII, 1875, p. 137; not of Peters.

share. The additional anterior temporal is derived from the cutting off of the anterior inferior angle of the parietal—a character not seen in any of the other specimens of this genus at my disposal.

Gastrosteges, 161; anal, 1-1; urosteges, 61 (extreme tip injured).

Measurements.—Total length, 450 mm; tail, 95 mm.

Conophis rittatus sumichrastii Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
	1	Guadalajara, Mexico	J. J. Major	Alcoholic.

CONIOPHANES Hallowell.

Coniophanes HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1860, p. 484.—COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 248.

Glaphyrophis JAN, Elenco Sist. d. Ofidi, 1863, p. 54.

Erythrolamprus COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 55.—BOULENGER, part, Cat. Snakes Brit. Mus., III, 1895, p. 199.

Posterior maxillary teeth elongate, grooved; cephalic shield normal; two nasals; loreal present. Scales smooth, without fossa. Anal and subcaudal scuta divided. Pupil round.

This genus is restricted to Central America and the adjacent parts of the Columbian region, since a species (*C. dromiciformis*) is found on the Pacific slope of the Andes, near the equator. The remaining nine species belong to Central America and Mexico, and one of them has been taken in the United States, on the lower Rio Grande. The typical species are brown or red, with black stripes, and are of delicate and handsome tints. Another pattern is seen in the *E. lateritius* Cope, of western Mexico, which is a red species, with black head and neck. The species known to me are characterized as follows:

I. Scales in twenty-five longitudinal rows.

Superior labials, eight; three broad longitudinal black bands... *C. picivittis* Cope.

II. Scales in twenty-one rows; labials, eight.

Sides dark above; a broad dorsal band; light lines on the sides of the nape; belly unspotted *C. punctigularis* Cope.

Sides shaded above; no dorsal bands nor abdominal spots; light lines on sides of nape *C. fissidens* Günther.

Lines very indistinct, none on nape; two rows of brown spots on belly.

C. bipunctatus Günther.

III. Scales in nineteen rows.

Labials, seven or eight; sides dark; a dark vertebral stripe; a light band behind each orbit *C. imperialis* Baird and Girard.

Labials, seven; frontal plate wide; head black; body red..... *C. lateritius* Cope.

CONIOPHANES IMPERIALIS Baird.

Coniophanes imperialis COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 74; Check-list N. Amer. Batr. Rept., p. 38.

Tæniophis imperialis BAIRD, U. S. and Mex. Bound. Surv., II, 1859, p. 23, pl. xix, fig. 1.

Erythrolamprus imperialis BOULENGER, Cat. Snakes Brit. Mus., III, 1896, p. 206.

Scales in nineteen rows; labials seven or eight. Sides dark; a median dorsal band of varying width. Belly, red.

There are two well-marked subspecies of this species which are defined as follows:

Superior labials seven (exceptionally eight); median dorsal stripe on one row of scales *C. i. proterops* Cope.

Superior labials eight; median dorsal stripe, wide. . *C. i. imperialis* Baird and Girard.

CONIOPHANES IMPERIALIS PROTEROPS Cope.

Coniophanes proterops COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 249; Jour. Acad. Nat. Sci. Phila., 1875, p. 183.—BOCOURT, Miss. Sci. Mex., Rept., 1886, p. 654.

Glaphyrophis lateralis JAN, Arch. Zool. Anat. Phys. Modena, II, p. 304; Icon. Gén. Ophid., 1866, p. 18, pl. v, fig. 3.

Coniophanes lateralis F. MÜLLER, Verh. Nat. Gess. Basel, VI, 1878, p. 598.

Rhadinæa proterops COPE (error), Proc. Amer. Phil. Soc., XXII, 1885, p. 381.

Size rather small; scales in nineteen longitudinal rows, thin, elongate, obtuse. Head scarcely distinct, short profile of muzzle not elevated. Anterior plates of the head small; loreal a little longer than high; one preocular, two postoculars. Superior labials seven, third and fourth entering the orbit. Vertical plate elongate, lateral borders convergent, posterior angle acute. Occipitals long. Inferior labials nine; genieals two pairs, nearly equal. Gastrosteges 118–130, anal divided; urosteges 82.

Measurements.—Length of tail, 133 mm.; total length, 362 mm. The stump of the tail appears tetragonal in section. Coloration above, light brown, every scale densely punctulated with darker, especially near the margins. From the first to the fourth row of scales this is deeper, giving the sides a darker shade. The vertebral row of scales from the occipitals to the end of the tail is also darker. Top of the head densely and obscurely vermiculated and punctulated. The dark shade on the fourth row of scales becomes a band anteriorly, and is bordered above and below with white on the neck. The lower white border is discontinued on the neck, but reappears as a spot three scales back of the occipitals. Inferior half of rostral, upper and lower labials, chin, throat, and belly light brownish yellow, densely punctulated with brown. Each labial with a darker spot in the center. Fewer punctulations on the urosteges.

This form differs from the typical *C. imperialis* not only in its very narrow dorsal stripe, but normally has only seven superior labials. This character is, however, inconstant, and it is probably best to look upon the form as a subspecies of the *C. imperialis*.

Contiophanes imperialis proterops Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
-----	1	Orizaba, Mexico	F. Sumichrast.....	Alcoholic.
-----	1	Tehuantepec	do	do.
6758	1	Guatemala.....	H. Hague.....	do.

The typical specimen in the museum of the Philadelphia Academy of Natural Sciences is from Jalapa, from R. M. De Oca.

CONIOPHANES IMPERIALIS IMPERIALIS Baird.

Taniophis imperialis BAIRD, U. S. and Mex. Bound. Survey, II, 1859, p. 23, pl. XIX, fig. 1.

Contiophanes imperialis COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 74.

Erythrolamprus imperialis COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 77.

Form slender, tail short. Head proportionally narrow posteriorly and broad on the nose; snout rounded. Rostral gibbous, twice as

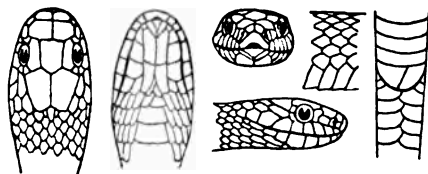


Fig. 313.

CONIOPHANES IMPERIALIS IMPERIALIS BAIRD.

× 1.5.

Brownsville, Texas.

Cat. No. 2060, U.S.N.M.

broad as high, the apex below the anterior frontals. Loreal as high as long, and more than half as large as the anterior frontals, which are themselves about one-third the size of the postfrontals. The frontal is pentagonal, narrow, and elongated, scarcely wider anteriorly, the acute posterior point entering between the occipitals; one anteorbital large, vertically elongated, broader

above; two postorbitals small, upper largest. Dorsal scales smooth, in nineteen rows; central scales narrow and acute, outer rows much broader, especially the first. Body above deep purplish black, with two dorsal stripes of yellowish brown from head to tip of tail, and separated by a narrower vertebral line of the ground color. Head black above, with two narrow yellow lines from the nostrils to the sides of the occiput, crossing the upper angle of the orbit. Upper labials and under part of head yellowish, minutely mottled with black. Ground color of the back extending onto the ends of the abdominal scutellæ. Middle of abdomen uniform light yellowish in the alcoholic specimen; said to be bright red in life.

Besides southwest Texas this species has been found near Tuxpan by Lincecum and at Jicaltepec, Vera Cruz, by the Geographical Commission of Mexico.

Contiophanes imperialis imperialis Baird.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
2060	1	Brownsville, Texas	Captain Van Vliet	Alcoholic.

CONIOPHANES LATERITIUS Cope.

Coniophanes lateritius COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 524.

Tachymenis lateritia GARMAN, N. Amer. Rept., 1883, p. 61.—GÜNTHER, Biol. Centr. Amer., 1895, p. 162.

Erythrolamprus lateritius COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 78.—BOULENGER, Cat. Snakes Brit. Mus., 1896, p. 205.

Tachymenis melanocephala PETERS, Mon. Berl. Akad., 1869, p. 876.

Erythrolamprus melanocephalus COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 78.

The whole body is bright vermillion, punctulated with brown, passing through orange to golden on the belly. The head and neck for ten scales posteriorly is black, the labials bordered and traversed by yellow lines, and the occipitals dotted with the same. Throat and chin yellow; black spotted. The head is broad posteriorly and the outline converged rapidly to the acute prominent muzzle. Loreal square, one preocular, two postoculars; seven upper labials; eye over third and fourth; fifth very large. Ten inferior labials; scales in nineteen rows. Vertical plate nearly as broad as long. Anal divided.

Measurements.—Total length, 606 mm. Of this the tail is 175 mm. in length.

But one example of this handsome species has come under my observation. According to Boulenger the *Tachymenis melanocephala* is the same. Peters describes his specimen as follows:

It was founded on a young specimen "which possibly belongs to *T. bipunctatus*, Günther, with which it agrees in respect to its pholidosis, and in the punctulation of the head shields and the markings on the infralabials. The ground color of the head, including the nape, to the tenth row of scales posteriorly, is blackish brown, behind which there is a yellowish collar around the neck four scales wide, while the remainder of the body is yellowish brown above; the underside yellowish, without black punctulations."

Coniophanes lateritius Cope.

Number of specimens.	Locality.	From whom received.	Nature of specimen.
1	Guadalazara, Mexico.....	J. J. Major.....	Alcoholic.

DIPSADINÆ.

I. Apex of hemipenis fionced (Flabellati).

Calyces large, irregular; gastrosteges angulate *Chrysopoelea* Boie

II. Caliculate, not capitate (Calyculati).

 α . Dipsadiform. β . No spines.

Calyces numerous; anal entire *Dipsadomorphus* Fitzinger

 $\beta\beta$. Spines present.

Calyces numerous; anal entire *Triglyphodon* Duméril and Bibron

Calyces very few; anal entire..... *Crotaphopeltis* Fitzinger

 $\alpha\alpha$. Attenuate.

β . No diverticulum..... *Cladophis* Duméril; *Oxybelis* Wagler

$\beta\beta$. Hemipenis with a diverticulum..... *Dryophis* Merrem

- aaa*. Fusiform.
β. A loreal plate.
 Tail abbreviated, rough *Procinura* Cope¹
 Tail normal *Scolecophis* Cope
ββ. No loreal.
 Two pairs of genials *Tantilla* Baird and Girard
 One pair of genials *Pogonaspis* Cope
- III. Caliculate and capitate (Capitati).
 Calyces numerous; colubriform; anal double *Sibon* Fitzinger
- IV. Spinous to apex (Spinosi).
 Fusiform; rostral prominent; anal divided *Ogmis* Cope
- V. Apex with longitudinal plicæ; calyces few and irregular.
 Spines few; head very distinct; anal double *Trimorphodon* Cope

The groups of Dipsadinae, from I to IV, inclusive, correspond in penial characters to the groups similarly numbered in the Dromicinae and Scytalinae, respectively.

I have not been able to examine the penial structure of some of the genera of this subfamily which inhabit the Old World, so I give a synopsis of the genera as otherwise defined:

- A. Head shorter and more obtuse; very distinct.
 I. Subcaudal scuta entire.
 Parietal plates replaced by scales; other plates normal. *Pythonodipsas* Günther
- II. Subcaudal scutella divided.
α. No teeth anterior to the grooved maxillary.
 Scales smooth *Opisthoplus* Peters
αα. Median maxillary teeth not much shortened.
 Nostril large, between two nasals and the internasal; vertebral scales larger *Rhinobothryum* Wagler
 Two nasals inclosing nostril; body elongate, compressed, anal entire; vertebrals generally larger *Dipsas* Laurentis²
 Two nasals inclosing nostril; body less compressed; anal double; vertebral row not larger; one loreal *Sibon* Fitzinger³
 No nasal; vertebrals equal *Hemidipsas* Günther⁴
ααα. Median maxillary teeth shortened.
 Two nasals and two or more loreals; anal double; vertebrals equal.
Trimorphodon Cope
- AA. Head very elongate; muzzle produced.
 I. Middle maxillaries not elongate; posteriors grooved.
 Scales keeled *Dryophis* Boie
 Scales smooth *Dryinus* Wagler
- II. Middle maxillaries elongate; posteriors grooved.
α. An elongate nasal appendage.
 Pupil horizontal *Passerita* Gray
αα. No elongate nasal appendage.
 A loreal plate; prenasals joined on the middle line *Gephyrius* Cope
 A loreal plate; nasals not joined *Tragops* Wagler
 No loreal plate; nasals separate *Tropidococcyx* Günther

¹ *Elapomorphus*, *Phalotris*, and *Apostolepis* probably belong here.

² *Boiga* Fitzinger; *Triglyphodon* and *Himantodes* Duméril and Bibron; *Eudipsas* Günther; *Toxicodryas* Hallowell.

³ *Crotaphopeltis* Fitzinger.

⁴ *Eumesodon* Fitzinger.

The genera of Dipsadinae are distributed as follows:

Paleotropical.	Palaearctic.	Nearctic.	Neotropical.	Ethiopian.
Ophiathopius				Pythonodipsas.
Dipsas				Dipsas.
			Rhinobothryum	
			Sibon	
			Trimorphodon	
Passerita			Dryophis	Dryophis.
Gephyrinus			Dryinus	Dryinus.
Tragops				
Tropidococcyx				

TRIMORPHODON Cope.

Trimorphodon COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 297; Bull. U. S. Nat. Mus., No. 32, 1887, p. 68.

Posterior maxillary tooth elongate, grooved; anterior teeth of both jaws elongate; intermediate teeth of the maxillary series shorter. Head plates normal; two nasals; two loreals, one in front of the other. Pupil vertical. Head very distinct. Scales smooth, subequal. Anal scutum divided; subcaudal scuta in two series.

This genus includes species which inhabit Central America, Mexico, and the adjacent parts of the United States. It is allied to *Sibon*, from which the elongate anterior teeth and the divided anal scuta distinguish it. No species of *Sibon* is known to possess two loreals, one anterior to the other. The species of *Trimorphodon*, with their wide triangular head, narrow neck, and slitlike pupil, considerably resemble venomous snakes, which their pugnacious disposition does not diminish. They differ as follows:

I. Scales in 21 (23) rows; superior labials nine.

Head, with brown chevrons above; nape with a brown collar; back with diamond-shaped spots *T. lambda* Cope.

Head with a lyre-shaped pattern above; nape with parallel stripes; dorsal spots in pairs *T. lyrophanes* Cope.

II. Scales in 23 rows; superior labials seven.

Top of head black, with a white T-shaped spot; dorsal spots entire transverse diamonds *T. tau* Cope.

III. Scales in 23 (24) rows; superior labials eight.

Top of head brown, with a small Y-shaped mark; dorsal spots transverse diamonds, more or less transversely divided by paler; nape with a brown collar. *T. upsilon* Cope.

IV. Scales in 23 (24) rows; superior labials nine.

Top of head brown; dorsal spots numerous transverse more or less divided diamonds *T. collaris* Cope.

Top of head white, with three round black spots; dorsal spot; few transverse undivided black rhombs, with pale edges *T. wilkinsonii* Cope.

V. Scales in 25 (27) rows; superior labials nine.

Top of head with chevron bands; dorsal spots formed of four confluent spots and inclosing a pale center *T. biscutatus* Duméril and Bibron.

Of the preceding species I have before me one each of the *T. lambda*, *tau*, *collaris*, and *wilkinsonii*. Of the *T. lyrophanes* there are six specimens; of the *T. upsilon* six, and of the *T. biscutatus* four.

The type of the genus is the *T. lyrophanes*. It is the only species found within the limits of the United States.

TRIMORPHODON LYROPHANES Cope.

Trimorphodon lyrophanes COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 297; Proc. Amer. Phil. Soc., 1885, p. 286.—BOULENGER, Cat. Snakes Brit. Mus., III, 1896, p. 56.

Lycodon lyrophanes COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 343.

Scales in twenty-one (in some specimens, for a short distance, in twenty-three) rows rather broad posteriorly and upon the middle of the body, not larger upon the vertebral line. The body anteriorly is slender, contracting to a small neck. Tail less than one-sixth of the total length. Head very distinct, the temples much swollen, so that the greatest breadth in life is just posterior to the eyes, though the length of head posterior to the angle of the vertical shield is one line greater than that

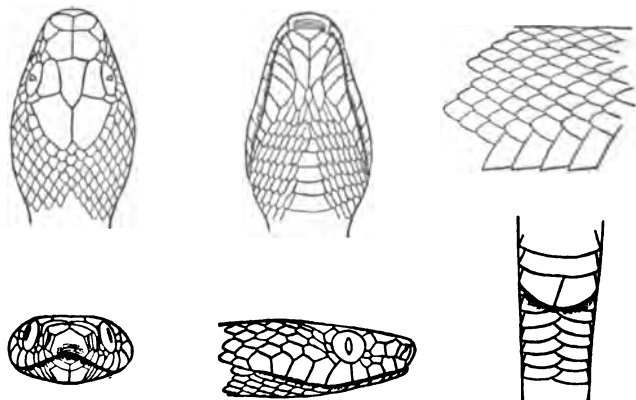


Fig. 314.

TRIMORPHODON LYROPHANES COPE.

=1.

Cape St. Lucas, Lower California.

Cat. No. 4680, U.S.N.M.

anterior. Side of the head constricted at the orbits, the muzzle rather narrow and truncate. Rostral plate broader than high, with but four sutural borders, the superior very long; the apex apparent upon the surface of the head. Prefrontals much broader than long; one-third the size of that part of the prefrontals visible from above. Upon a vertical view, the postfrontals appear longer than broad. Occipitals, superciliaries, and vertical developed; the last presenting a right angle posteriorly, and having the lateral borders slightly concave and converging; the first not longer, and about as wide as long, in contact with a large scale in their posterior, common emargination. Nasal plates distinctly divided, very small, higher than long. Loreal plates two, the anterior higher than long, intercalated superiorly between the prefrontal and postfrontal, posterior as long as high. Preoculars three, the superior largest, not in contact with the vertical; the inferior bounded anteriorly by the third upper labial. Postoculars three, the inferior a

little the largest. Superior labials nine, fourth and fifth entering the orbit, sixth largest, higher than broad. Inferior labials twelve, the third and fourth narrow, and much produced posteriorly. Genaeals two pairs, the anterior longest. Gastrosteges, 236; one divided anal; urosteges, 70.

Measurements.—Total length, 696 mm.; tail, 108 mm.

Seven teeth upon the superior maxillary bone, of which one posterior is elongate and grooved, three central, small and recurved, and three anterior, very long, the first longest and least recurved. The central three are not separated from those anterior and posterior to them by spaces wider than those existing between themselves. Palatine teeth six, the anterior three the longest, all longer than the pterygoids. The three anterior mandibular teeth longer and more widely spaced than the posterior, having an outward direction as in *Hormonotus* Hallowell.

The ground color is a light gray. The muzzle is crossed by an indistinct ashy band, which extends upon the anterior part of the postfrontals. The posterior half of these plates is involved in a deep brown band, which crosses the head between the eyes, and whose posterior border is very concave, extending upon the superciliaries to the vertical plane of the pupil of the eye. This band is continued posteriorly upon the inferior postocular and sixth upper labial. A pair of broad diverging bands begins one band on either side of the center of the vertical, crosses the superciliary and occipital shields, and following the expanded outline of the temporal and tympanic regions, contracts and becomes longitudinal and parallel upon the neck. A brown spot upon the posterior extremity of the vertical plates with a posterior elongation, completes the resemblance of this figure to a lyre, or still more to that musical (?) instrument known to children as the "Jew's-harp." The ground color appears upon the vertex as an anchor-shaped figure, and on the cheek as an oblique band. The back, as far as the anus, is ornamented with twenty-one pairs of deep brown spots, their gemination only apparent anteriorly by the punctulate character of the scales in intervals between the pairs. These intervals are always about three scales wide, the lesser, two and a half anteriorly, one and a half posteriorly. Dorsal spots seven scales wide; as the scales are broader posteriorly, the spots are also. There is an irregular series of lateral spots, one opposite each of the intervals, sometimes confluent with the dorsal spots; anteriorly they form a very narrow broken band. Another series of spots involves the tips of pairs of the gastrosteges, which are separated by two, three, four, or even five immaculate ones. Ten confluent pairs of spots on the upper surface of the tail. Whole under surface whitish.

This species is most nearly allied to the *T. lambda* Cope. From this one it will be always distinguished by the two parallel stripes on the neck, which extend to the superciliary plates. Sometimes (Cat. No. 8760) the stripes do not connect with the superciliary stripes and join on the parietal plates.

This species presents, in several of the specimens examined, the peculiarity of having an even number of rows of scales—twenty.

Trimorphodon lyrophanes Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4680	2	Cape St. Lucas, L. California.	.....	John Xantus.....	Alcoholic.
5283	1	Fort Buchanan, Arizona.	.....	Dr. B. J. D. Irwin, U. S. A.	do.
12632	3	La Paz, L. California.....	Feb. —, 1882	L. Belding	do.
8760	1	Southern Arizona.....	.....	H. W. Henshaw	do.
19673	1	Fort Huachuca, Arizona..	.....	Dr. T. Wilcox, U. S. N...	do.

TRIMORPHODON LAMBDA Cope.

Trimorphodon lambda COPE, Proc. Amer. Phil. Soc., 1885, p. 286.

Muzzle rather elongate, as in the *T. biscutatus*. There are three loreals, and the oculars are 3-3; the temporals are 3-4-3-4. The fourth and fifth labials enter the orbit, and the sixth, seventh, and eighth are higher than long. Pregeneials longer than postgeneials. Internasals small, wider than long; parietals rather short. Gastrosteges, 234; anal, 1-1; urosteges, 83.

Color above light gray, crossed by brown transverse diamond-shaped spots, each with a pale transverse center. Three or four of the most anterior spots are subhexagonal, being truncate at each side. All are surrounded by a pale shade. Each end of every second or third gastrostegite is marked with a small dark-brown spot, which extends upward on the first row of scales, and sometimes is confluent with the lateral apex of the dorsal spot.

Measurements.—Total length, 304 mm.; length of tail, 54 mm. From Guaymas, Sonora. Presented to the U. S. National Museum by Mr. H. F. Emerich. Cat. No. 13487.

TRIMORPHODON UPSILON Cope.

Trimorphodon upsilon COPE, Proc. Amer. Phil. Soc., XI, 1869, p. 152; XXIII, 1886, p. 286.—GÜNTHER, Biol. Centr. Amer., Rept., 1895, p. 175.—BOULENGER, Cat. Snakes British Mus., III, 1896, p. 54.

Dipsas biscutata var. *latifascia* PETERS, Mon. Berl. Acad., 1869, p. 877.

Eteirodipsas biscutata JAN, Icon. Gén. Ophid., 1872, p. 39, pl. I, fig. 3.

Trimorphodon collaris COPE, Journ. Acad. Nat. Sci. Phila. (2), VIII, 1876, p. 131; Proc. Amer. Phil. Soc., XXIII, 1886, p. 286.

Sibon biscutatum GARMAN, part, N. Amer. Rept., 1883, p. 16.

Sibon upsilon GARMAN, N. Amer. Rept., 1883, p. 134.

Rostral broader than deep, the portion visible from above measuring one-fourth to one-third its distance from the frontal; internasals much shorter than the prefrontals, which are nearly as long as broad; frontal once and a half to once and two-thirds as long as broad, as long as or a little longer than its distance from the end of the snout, as long as the parietals; two or three loreals; two preoculars and a subocular;

upper preocular in contact with or narrowly separated from the frontal; two or three postoculars; temporals 2 + 2, 2 + 3, or 3 + 3; eight or nine upper labials, fourth and fifth entering the eye; five or six lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales in twenty-one or twenty-three rows. Ventrals, 205-236; anal divided; subcaudals, 61-72.

Pale gray-brown above, with dark, black edged crossbars narrowing on the sides and descending to the ends of the ventrals; head dark brown above, pale grayish on the occiput, usually with a light crossbar between the eyes; a V-shaped light marking sometimes present on the parietal shields, embracing the frontal; whitish beneath, more or less mottled with dark, and with dark spots on the sides. In the young the dark bars are much wider, separated by narrow whitish interspaces, and they may form complete annuli.

Measurements.—Total length, 660 mm.; tail, 120 mm.

This species has not been found nearer our political borders than the city of Chihuahua, where Mr. Edward Wilkinson found it. He also found it at Batopilas, in Chihuahua, and Dr. Dugès has sent it from Guanajuato. Further south, Dr. Bernad sent it from Zacualtipan (Hidalgo) and Mr. Major from near Guadalajara.

TRIMORPHODON VILKINSONII Cope.

Trimorphodon wilkinsonii COPE, Proc. Amer. Phil. Soc., 1885, p. 285.

Scales in twenty-three rows. Superior labials nine, of which the fourth and fifth enter the orbit, and of which all are higher than long, excepting the fifth and the eighth. Loreals, 2; oculars, 3-3; temporals, 3-3-3. Rostral not prominent, but the apex is recurved on the summit of the snout. Frontal plate rectangular, the lateral and anterior sides equal. Parietals narrowed posteriorly. Inferior labials eleven, the fifth in contact with pregenaeals, and none in contact with postgenaeals. Postgenaeals much shorter than pregenaeals. Gastrosteges, 231; anal, 1-1; urosteges, 77. The body is compressed, and the head is very distinct.

Measurements.—Total length, 272 mm.; tail, 45 mm.; head to rictus oris, 9.2 mm.

General color, gray; the back is crossed by narrow black cross bands at rather remote intervals. These bands are pale bordered and narrow to an apex below, which is above the gastrosteges. They become narrower posteriorly, and on the tail form half-rings. On the extremity of

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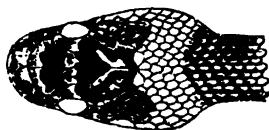
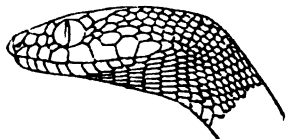


Fig. 315.

TRIMORPHODON UPSILON COPE.

= 1.

Mexico.

Collection of E. D. Cope.

every third or fourth gastrostege there is a small black spot throughout the length to the tail. There is a larger black spot on the sides between the extremities of a few of the cross bands. The superior border of the sixth and the adjacent part of the fifth superior labial is black. On the top of the head are three large round black spots; one is on the center of the frontal and one is on the anterior part of each parietal. No cross bands on the muzzle. The dark cross bands are only two scales wide on the posterior part of the body; on the anterior part they are three or four scales wide. The interspaces vary from twelve anteriorly to seven posteriorly.

One specimen, Cat. No. 14268, was sent from near the city of Chihuahua by Mr. Edward Wilkinson to the U. S. National Museum. This species is nearest the *T. biscutatus* Duméril and Bibron in squamation, but differs greatly in coloration from this or any other species of the genus.

SIBON Fitzinger.

Sibon FITZINGER, Neue Class. Reptilien, 1826, p. 29.

Heterurus DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 1170.

Leptodira GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 165 (from *nomen nudum* of Fitzinger, 1843).

Eteirodipsas JAN, Elenco Sist. Ofidi, 1863, p. 105.

An elongate grooved tooth on the posterior part of the maxillary bone; other teeth subequal. Head plates normal; one loreal. Preanal and subcaudal scuta double; scales smooth, with two apical pits. Pupil vertical. Hemipenis undivided with bifurcate sulcus spermaticus, and numerous spines below and calyces above. The latter present a free margin to the superior spinous region, that is, the organ is capitate.

This genus has near allies among the Dipsadine group, to which it belongs. From *Dipsas* it is distinguished by the divided preanal plate; from *Himantodes* by the double scale-pits, that genus having but one. From *Trimorphodon* it differs in the equality of the ungrooved maxillary teeth and the single loreal plate. The greater number of species of this genus are Mexican and Central American, one species (*S. annulatum*) extending its range throughout tropical South America. One species only has been found on the Rio Grande River, and extends within our borders. The species are closely allied and are subject to some variation. One only (*S. rhombiferum* Günther) I have not seen, and I give its characters on the authority of Günther. All the species known have but one temporal plate in the first row.

In some of the forms the head is less distinct posteriorly than is characteristic of the typical genera of this subfamily, giving a coroneline form and forming a transition to the more fusiform types.

The *S. annulatum* is the only species which ranges over Brazil; the others are all Central American (= Mexican).

The species differ as follows:

I. Superior labials eight to nine.

α . Scales in 21-25 rows.

Body slender, compressed; scales in twenty-one rows; preoculars two; dorsal spots small, no postocular band.....*S. annulatum* Linnaeus.¹

Body robust, cylindric; scales in twenty-one rows; preoculars two; dorsal spots large, wide; a conspicuous black postorbital band.

S. yucatanense Cope.²

Robust; scales 23-25 rows; preoculars three; conspicuous dorsal spots, and postorbital band.....*S. septentrionale* Kennicott.

Robust; scales twenty-one; one preocular; numerous transverse black dorsal rhombs, and no lateral spots; top and sides of head black.

S. personatum Cope.³

Robust; scales twenty-five; loreal longer than deep; brown with yellow crossbars and black-edged brown dorsal rhombs...*S. rhombiferum* Günther.⁴

Robust; scales twenty-three; preoculars two; loreal square; black with narrow gray cross bands; a conspicuous postocular band; labials nine.

S. frenatum Cope.⁵

$\alpha\alpha$. Scales in nineteen rows.

Robust; preoculars two; loreal short; parietal quite or nearly touching postocular; cross bands much wider than interspaces; a postocular stripe.

S. nigrofasciatum Günther.

II. Superior labials seven.

Robust; scales nineteen rows; preoculars two; pale brown, with several rows of small blackish spots; a blackish half collar above; head paler; no postocular band.....*S. pacificum* Cope.

SIBON SEPTENTRIONALE Kennicott.

Sibon septentrionalis COPE, Proc. U. S. Nat. Mus., 1892, p. 678.

Dipsas septentrionalis KENNICOTT, U. S. Mex. Bound. Surv., Reptiles by Baird, II, p. 16, pl. 8, fig. 1.

Sibon annulatum septentrionale COPE, Check-list N. Amer. Batr. Rept., 1875, p. 38; Cat. Batr. Rept. Centr. Amer. Mex., 1887, p. 67.

Leptodira septentrionalis BOULENGER, Cat. Snakes Brit. Mus., III, 1896, p. 93.

Body moderately slender, very much tapering anteriorly and posteriorly. Tail slender, about one-fifth the total length. Head ovoid, somewhat depressed, very large, twice as wide posteriorly as the neck. Crown flattened, concave behind the eyes; temporal regions much swollen. Snout obtusely pointed, scarcely more depressed than the vertical region. Vertical plate pentagonal elongated, broader in front, concave on the sides. Occipitals triangular, nearly as broad as long. Superciliaries small. Rostral broader than high. Nasals much larger than prefrontals, two-thirds as high as long, emarginate above to receive the exterior edge of prefrontals. Loreal smaller than upper preorbitals,

¹ *Leptodira annulata* Günther, *Dipsas annulata* Duméril and Bibron; South America, Panama, Costa Rica.

² *Sibon annulatum yucatanense* Cope, Proc. Acad. Nat. Sci. Phila., 1866, p. 127; Yucatan, Belize.

³ *Leptodira personata* Cope, Proc. Acad. Nat. Sci. Phila., 1868, p. 310; Mazatlan, Mexico.

⁴ *Leptodira rhombifera* Günther, Ann. Mag. Nat. Hist., 1872, p. 32.

⁵ *Sibon frenatum*, Proc. U. S. Nat. Mus., 1886, p. 184; Jalapa, Mexico.

as high as wide. Three preorbitals; the upper more than three times as large as either of the two lower, its inner angle produced to the vertical, separating the superciliary and postfrontal. Two postorbitals; upper largest. Eight upper labials; sixth and seventh four times as large as either of the three anterior ones. Ten lower labials; fifth and sixth largest. Dorsal scales in twenty-one to twenty-three rows; narrow, acute posteriorly; first lateral row much the widest.

Body above, with broad, lustrous, brownish-black half rings on a light-yellowish ground. The black rings six to eight scales wide in the middle, narrowing very much, or even rounded off, laterally, sometimes not extending quite to the abdomen. Light intervals, one or two scales

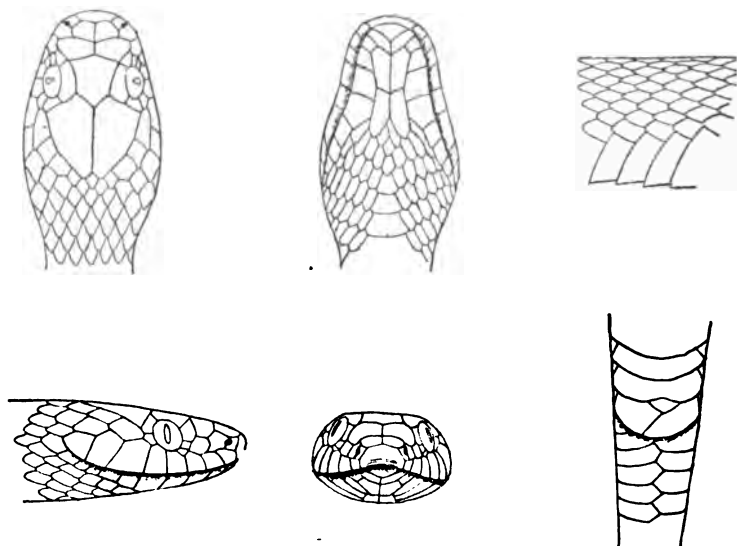


Fig. 316.

SIBON SEPTENTRIONALE KENNICOTT.

= 1.

Matamoras, Tamaulipas, Mexico.

Cat. No. 4267, U.S.N.M.

wide, on the vertebral region, widening to three or four times as much nearer the abdomen. Abdomen and lower surface of head uniform light yellowish. An irregular light occipital ring. Upper labials and anterior part of head brownish, lighter than the dark dorsal band.

The largest species of the genus, ranging from Panama to Cameron County, Texas, inclusive.

Sibon septentrionalis Kennicott.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
4267	2	Matamoras, Mexico.	Lieutenant Couch.	Alcoholic.
2288	1	Brownsville, Texas.	Captain Van Vliet.	do.
17066	1	Cameron County, Texas.	C. K. Worthen.	do.

SCOLECOPHIS Cope.

Scolecophis COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 259; 1861, p. 74.—BOCOURT, Miss. Sci. Mex., Rept., 1883, p. 577.—BOULENGER, Cat. Snakes Brit. Mus., III, 1896, p. 210.

Platyocranium JAN, Elenco Sist. Ofid., 1863, p. 40.

Cephalic plates normal; a loreal. Anal plates divided.

Two species of this genus are known from the Central American region of the neotropical realm. These are the *S. atrocinctus* Schlegel, of the strictly Central American countries, and the *S. michoacanensis*¹ Dugès, of Mexico proper. To these Boulenger adds my species, *Procinura æmula*, which I referred to a distinct genus on account of the tubercular carination of the robust tail. This is very different from the characteristic of the other species, where the tail is smooth and slender. However, the value of this character may be for the present problematical, so I provisionally follow the Catalogue of the British Museum.

SCOLECOPHIS ÆMULUS Cope.

Scolecophis æmulus BOULENGER, Cat. Snakes Brit. Mus., III, 1896, p. 212.

Procinura æmula COPE, Proc. Amer. Phil. Soc., 1879, p. 262.

Scales broad, rounded, in fifteen longitudinal series, the median rows rather smaller than the lateral, of which three rows are equal. Muzzle projecting beyond the mandible, rounded, the rostral plate visible from



Fig. 317.

SCOLECOPHIS ÆMULUS COPE.

= 1.

Type.

Batopilas, Chihuahua.

Collection of E. D. Cope.

above, presenting an obtuse angle posteriorly. Top of head flat. Pre-frontals much wider than long, their external canthal border equal to that of the internasals. Frontal wide, sending a long angle backward. Parietals short, wide; temporals 1-2, the first small, as deep as long. Superior labials seven, all except the first deeper than long, the third and fourth entering the orbit. Preorbital vertical, narrow, not reaching frontal; postorbitals two, equal and small. Loreal quadrangular. Inferior labials eight, fourth largest; pregenaeals three times as long as postgenaeals and separated from gastrosteges by six rows of scales. The dorsal carinae first appear on the twenty-second transverse row of scales anterior to the vent, and occupy the median nine series. All the

¹Having examined the typical specimens through the kindness of Dr. Dugès, I can confirm Boulenger's observation that the posterior teeth are grooved. The groove is shallow, like that of *Ogmia acutus*.

caudal series are keeled, and as they are wider than long, the free apices of the keel, projecting, give them a depressed pyramidal form. Gastrosteges, 148; urosteges, 41.

In the coloration of the body this species is an almost exact repetition of the *Elaps fulvius*. It is surrounded by wide black rings, which are broadly bordered with yellow and separated by red interspaces of twice their width. The scales of the red spaces have each a central black spot, which is more distinct than in *E. fulvius*, on the anterior part of the body, above the sides; posteriorly they are weaker. The black annuli pass round the belly, but are all somewhat broken anteriorly. Between them the gastrosteges have black shades. The coloration of the head differs from that of the *E. fulvius* in having merely a large black spot covering the parietal, superciliary, and frontal plates, and extending round the eye, but not reaching the edge of the lip. Muzzle and chin unspotted.

Measurements.—Total length, 364 mm.; length of rictus oris, 11 mm.; length of tail, 61 mm.

Although this curious and handsome serpent so much resembles the *Elaps fulvius*, it is not yet known that the two species inhabit the same region.

This species is near to *Scolecophis atrocinctus*, but the peculiar tubercular carination of the tail distinguishes it. It inhabits a rocky, mountainous region, and I have little doubt that this peculiar character enables the animal to force itself into the earth or beneath stones. The tail is used as a fulcrum in pushing against rough and resistant bodies.

TANTILLA Baird and Girard.

Tantilla BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 131.—COPE, Jour. Acad. Nat. Sci. Phila. (2), VIII, 1875, p. 143; Bull. U. S. Nat. Mus., No. 32, 1887, p. 52; Proc. U. S. Nat. Mus., XIV, 1892, p. 597.

Homalocranium DUMÉRIL and BISSON, Mém. Acad. Sci., XXIII, 1853, p. 490.—GÜNTHER, Cat. Col. Snakes Brit. Mus., 1858, p. 18.

Head depressed, continuous with the body. Cephalic plates normal. Internasals and postfrontals two each. Posterior maxillary tooth grooved. Two nasals, nostrils in the anterior plate. No loreal. Anterior orbital one; posterior one or two. Eyes below the medium size. Body, subcylindrical; tail short. Scales smooth. Postabdominal scutella bifid. Subcaudal all divided.

This genus is distributed throughout the neotropical realm excepting the West Indian region, Trinidad excepted. Its species are especially abundant in the Central American district. Three species are found in the nearctic realm. They differ as follows:

I. Superior labials, six; orbitals, 1-1.

- | | |
|---|--------------------------------------|
| Muzzle produced; preorbital not in contact with superciliary nor nasal; three longitudinal bands..... | <i>T. calamarina</i> Cope. |
| Muzzle less produced; preorbital in contact with superciliary and nasal; temporal one; three bands..... | <i>T. bimaculata</i> Cope. |
| Temporals two; no bands | <i>T. gracilis</i> Baird and Girard. |

II. Superior labials, seven; orbitals, 1-1.

Coloration uniform *T. planiceps* Blainville

III. Superior labials, seven; two postorbitals.

 α . Postnasals in contact with preocular, or nearly so. β . Posterior labials elevated, separated from parietals by one temporal.
Form slender; a yellow, black-bordered collar near parietal plates;
below red. *T. miniata* Cope. $\beta\beta$. Posterior labials elevated, bounded above by two temporals. Labials
higher; first inferior labials separate; black, with wide yellow
collar. *T. masta* Günther.
Frontal narrower; posterior labials higher, body banded.*T. melanocephala* Linnæus.Frontal wider; posterior labials lower; body uniform red. *T. rubra* Cope. $\beta\beta\beta$. Posterior labials low, bounded above by two temporals. γ . Inferior labials of first pair in contact with middle line.Postnasal very small; collar far behind head; body banded; uros-
teges, 51. *T. armillata* Cope.

Postnasal large; collar crossing parietal scuta; body unicolor.

T. coronata Baird and Girard. $\gamma\gamma$. Inferior labials separated by symphyseal.Urosteges, 67; postnasal large, bounded below by first labial; a yel-
low collar. *T. reticulata* Cope.Urosteges, 57; postnasal chiefly bounded by second labial; head
black; no collar. *T. nigriceps* Kennicott.Urosteges, 39; first labial rising to nostril; head and body uniform
T. canula Cope.Urosteges, 25; nasale not interrupted by first upper labial; head
dark with a pale occipital spot. *T. vermiformis* Hallowell. $\alpha\alpha$. Postnasals separated from preocular by a wide space.

Urosteges, 57; unicolor, pale; top of head and collar black.

T. pallida Cope.Urosteges, 66; last upper labial larger than sixth; body above with
black and white half-rings. *T. semicincta* Duméril and Bibron.

Professor Jan¹ describes a *T. (Homalocranium) wagneri* said to have been taken in Florida. It is described as having an entire anal plate, and does not therefore belong to this genus. It has not been observed by American naturalists. It is said to have seven superior labials, and the scales in 15 series. It is reddish white above, with a black half color on the nape. This is separated from the dusky top of the head by a white cross band, and there is a white spot behind the eye.

TANTILLA GRACILIS Baird and Girard.

Tantilla gracilis BAIRD and GIRARD, Cat. Serp. N. Amer., 1853, p. 132.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 35.

Homalocranium gracile BOCOURT, Mission Scient. Mexique, 1883, p. 579, pl. xxxvi, fig. 5.—JAN, Icon. Gén. Ophid., Pt. 15, 1866, pl. II, fig. 1.

Tantilla hallowellii COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 77.

Anterior and postorbitals one each. Color uniform greenish brown above, lighter beneath; head darker.

Vertical plate subhexagonal, much shorter than in *T. coronata*. Post-

¹ Archivio per la Zoologia, Modena, December, 1861, p. 51.

frontals separated from the second upper labial by the postnasal. Nostril in the postmargin of the prenasal. Eyes very small and circular. Superciliaries proportionally smaller and narrower than in *T. coronata*. One anteorbital and one postorbital, both angular. Mouth deeply cleft. Upper labials six; fifth and sixth equal, larger than the rest; third and fourth beneath the eye, entering slightly into the orbit anteriorly and posteriorly. Temporal shields two, narrow and elongated. Body slender and subcylindrical, covered above with subrhomboidal or elliptical and smooth scales, constituting fifteen rows; outer row but slightly larger than the three or four succeeding rows. Tail very slender.

Ground color uniform greenish brown, lighter beneath. Head darker.

Cat. No. 4500; rows of scales, 15; upper labials, 6; gastrosteges, 129 + 1; urosteges, 45; total length, 144 mm.; tail, 34 mm.

The individual on which was based the *T. hallowellii* differs from the usual form in having a longer muzzle, so that the postnasal and pre-

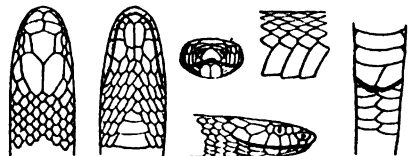


Fig. 318.

TANTILLA GRACILIS BAIRD AND GIRARD.

× 2.

Dallas, Texas.

Collection of E. D. Cope.

ocular scuta do not touch, permitting the contact of the postfrontal and labial scuta. The first temporal also separates the fourth and fifth superior labials more extensively than usual. To the latter character I find approaches in several specimens, but the former is repeated on one side of one specimen only, which is from San Diego, southwestern Texas. I

think the supposed species represents only an extreme individual variation. In Cat. No. 21218 there is a small inferior postocular on one side.

This species is common in southwestern Texas.

Tantilla gracilis Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
4500	11	Indianola, Texas.....	Capt. John Pope, U. S. A....	Alcoholic.
4750	1	Gilmer, Texas.....	J. M. Glasco.....	do.
11815	2	Old Fort Cobb.....	E. Palmer.....	do.
15670	2	San Diego, Texas.....	W. Taylor.....	do.
15671				
2057	1	Eagle Pass, Texas.....	A. Schott.....	do.
15556	1	Cook County, Texas.....	G. H. Ragadale.....	do.
21217	2	{ Washington County, Ar- kansas.	S. E. Meek.....	do.
21218				
22677	.....	Drake, St. Thomas County, Missouri.	J. Hurter.....	do.

TANTILLA PLANICEPS Blainville.

Tantilla planiceps COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 74.—Proc. U. S. Nat. Mus., XIV, 1891, p. 597.

Coluber planiceps BLAINVILLE, Nouv. Ann. Mus. Hist. Nat. Paris, III, 1834, p. 62, pl. XXVII, figs. 3, 3a, 3b.

Homalocranium planiceps DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 857.—BOCOURT, Miss. Sci. Mex., 1883, p. 581, pl. XXXVI, fig. 7.—JAN, Icon. Gén. Ophid., Pt. 15, pl. II, fig. 2.

Blainville describes this species as follows:

Uniform reddish above, of a soiled white beneath, with a black patch on the occiput and the beginning of the neck.

Body slender, rather elongated, cylindrical; head small, depressed, but little distinct; snout short and elliptical; tail rather long, slender, and very much tapering, one-fourth of the total length. Nostrils lateral, very small, situated in the middle of the nasal, which is elongated and single. Eyes of medium size. Mouth broad, considerably cleft; anus far back. Cephalic plates: two prefrontals and two postfrontals. No loreal. One anterior and one posterior. Abdominal scutellæ one hundred and thirty-four, beginning at some distance from the head. Subcaudal, fifty-six. Scales broad, convex, very smooth, opalescent, obliquely imbricated.

It was described from specimens obtained in Lower California by Botta. It has not yet come into the hands of American naturalists.

TANTILLA NIGRICEPS Kennicott.

Tantilla nigriceps KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 328.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 35.

Scoleophis fumiceps COPE, Proc. Acad. Nat. Sci. Phila., 1860, p. 371.

Homalocranium præoculum BOCOURT, Miss. Sci. Mex., Rept., 1883, p. 582, pl. XXXVI, fig. 8.

Form more slender and head narrower than in *T. gracilis*. Frontal plate more elongate posteriorly, parietals narrower. One anteorbital, two post-orbitals, the former in contact with loreal. Seven upper labials, the last largest, the third and fourth entering orbit. Temporals 1-1, both longer than wide. Color (in alcohol) uniform brownish white above, lighter beneath. Crown as far as behind the occipitals black, sometimes dark brown; no indication of a postoccipital black ring, as in *T. coronata*.

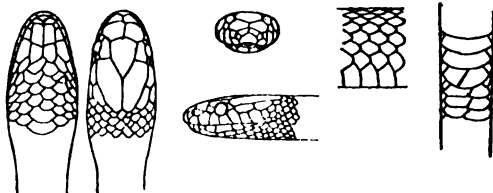


Fig. 319.

TANTILLA NIGRICEPS KENNICOTT.

× 2.

Dallas, Texas.

Collection of E. D. Cope.

Cat. No.	Scales.	Upper labials.	Gastroteges.	Urostege.	Length. mm.	Tail. mm.
2039.....	15.	7.	157 + 1.	39.	295.	54.
1176.....	15.	7.	168 + 1.	66.	312.	79.

The specimens from Fresno, California (Cat. No. 1176), represent a dis-

tinct variety. The black of the vertex extends on the sides of the head across the angle of the mouth to a short distance below it. It is squarely truncate behind by a narrow pale collar, which is again followed by a transverse row of brown specks, representing the collar of the *T. coronata*. A specimen from the Wichita River, northern Texas, the most northern locality known, has two preoculars on both sides.

Tantilla nigriceps Kennicott.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4755	1	Fort Riley, Kansas	.....	H. Brandt	Alcoholic.
2039	1	Gila River, New Mexico	.....	Dr. Thos. Webb	do.
11766	6	Fresno, California	— —, 1879	Gustav Eisen	do.
15669	1	San Diego, Texas	.....	W. Taylor	do.
19674	.....	Fort Huachuca, Arizona	.....	Wilcox	do.
15669	.....	San Diego, Texas	.....	William Taylor	do.
22378-80	.....	Mesilla Valley, New Mexico.	.....	T. D. A. Cockerell	do.
22386	.....	San Antonio, Texas	.....	H. H. and C. S. Brimley	do.

This species is abundant in western Texas.

Mr. Bocourt has described, under a distinct specific name, a specimen of this species which has abnormally two preocular plates.

TANTILLA CORONATA Baird and Girard.

Tantilla coronata BAIRD and GIRARD, Cat. Rept. N. Amer., Pt. 1, Serp., 1853, p. 131.—COPE, Jour. Acad. Nat. Sci. Phila., 1875, p. 144.

Homalocranium coronatum BOCOURT, Mission Sci. de Mexique, Reptiles, 1883, p. 589, pl. XXXVII, fig. 5.

Homalocranium wagnerii JAN, Icon. Gén. Ophid., Pt. 14, pl. II, fig. 3.

One auroorbital, two postorbitals. Body uniform reddish brown; head deep chestnut-brown, with a black band across the neck above, in advance of which is a narrow lighter space.

Snout prominent. Vertical plate hexagonal, anteriorly and posteriorly acute. Occipitals slender, rounded

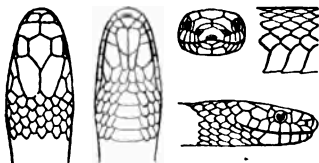


Fig. 320.

TANTILLA CORONATA BAIRD AND GIRARD.

× 2.

Mississippi.

Cat. No. 1875, U.S.N.M.

exteriorly. Postfrontals angular, excluded from the orbit, though extending on the sides of the head. Prefrontals triangular. Rostral proportionally broad. Nostrils situated on the posterior margin of the prenasal plate, and visible from above. Postnasal elongated, contiguous anteriorly to the auroorbital plate, and above to the postfrontal. Eyes rather small, circular. Superciliaries proportionately large, angular. Auroorbital one; postorbitals two, all angular. A large pretemporal shield and two smaller ones behind. Mouth deeply cleft. Upper labials seven, seventh the largest, third and fourth beneath the eye. Inferior labials seven, fourth

the largest. Mental scutellæ, one pair. Body slender, tail rather short, tapering to a point. Scales subelliptical, considerable broader in outer row.

Ground-color of body uniform light-reddish brown; light beneath. Head deep chestnut-brown; upper part of neck with a blackish-brown half-ring, covering three scales in length, between which and the head a narrow space of the ground-color exists across the tip of the occipitals.

Cat. No. 1875; rows of scales, 15; upper labials, 7; gastrosteges, 143; urosteges, 35; total length, 205 mm.; tail, 31 mm.

In its distribution this species extends much farther east than any of its North American congeners. A specimen is in my collection from Volusia, Lake George, Florida. It is yet rare in museums.

Tantilla coronata Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
4868	1	Liberty County, Georgia....	Dr. W. L. Jones	Alcoholic.
1875	1	Mississippi	D. C. Lloyd	do.
12523	1	Clear Water, Florida	S. F. Walker	do.
22685	.....	Chuluota, Orange County, Florida	Robt. A. Mills	do.

HOMALOPSINÆ.

I. Sulcus of hemipenis undivided; flounced.

Fusiform; internasals distinct; flounces spinous; subcaudals one-rowed, *Uriëchis* Peters.

Fusiform; internasals and nasals fused; flounces not spinous; subcaudals two-rowed.....*Stenorkhina* Duméril and Bibron.

II. Sulcus bifurcate; flounced.

Hemipenis bifurcate; spines numerous; one internasal.....*Cantoria* Girard.

III. Sulcus bifurcate; not flounced (Hemipenis bifurcate).

α. No tentacles on muzzle.

Spines numerous; one internasal plate; parietals undivided. *Homalopsis* Kuhl.

Spines numerous; two internasal plates; parietals subdivided, *Cerberus* Cuvier.

αα. Tentacles on muzzle.

Spines numerous; one internasal; parietals undivided...*Herpeton* Lacépède.

The above genera are the only ones which I have been able to examine as to their penial characters. I therefore give the following general synopsis:

* Muzzle with a pair of tentacular processes.

One internasal plate; parietals undivided*Herpeton* Lacépède.

** No tentacular processes.

α. Scales keeled.

β. One internasal plate.

Parietal plates undivided*Homalopsis* Kuhl.

ββ. Two internasal plates.

Parietal plates subdivided*Cerberus* Cuvier.

$\alpha\alpha$. Scales smooth.

β . One internasal plate.

γ . Gastrosteges with two keels.

Parietal plates subdivided.....*Hipistes* Gray.

$\gamma\gamma$. Gastrosteges not keeled.

Nasal plates in contact behind rostral; eye resting on labial plates,
Hypsiarkina Wagler.

Nasal plates in contact; eye bounded below by scales,

Tachyplotus Reinhardt.

Nasal plates separate; eye on labials.....*Fordonia* Gray.

Nasal plates separate; eye bounded with scales below,

Cantoria Girard.

$\beta\beta$. Two internasal plates.

Supraorbital and posterior labial plates subdivided; two anals,

Homalopsis Peters.

Nasals in contact behind rostral; parietals entire.....*Ferania* Gray.

Two pairs of prefrontals; nasal plates separate, undivided; eye on
labials; anal double.....*Heleophis* Müller.

The geographical distribution of these genera is East Indian.

The habit of the subfamily is aquatic, and it embraces the fresh-water snakes of all countries. Many of the East Indian forms are partially marine, living in tide water or on the coast, as *Homalopsis*, *Cerberus*, etc. *Hipistes* imitates in its appearance the sea snakes, and is often taken with them, and with eels, in their nets by the Malay fishermen. *Herpeton* inhabits the Cambodia and other rivers of Farther India, and has a vegetable diet. Most of the other aquatic genera are piscivorous.

PROTEROGLYPHA.

I have been able to examine a limited number of species of this superfamily, and must therefore present an imperfect synopsis of the genera. I have examined enough of the species to affirm that they present variations of type similar to those seen among the superfamilies already considered. All the forms that I have seen have a bifurcate sulcus and all are spinous.

There are three families, as follows:

A postfrontal bone; fang grooved.....*NAJIDÆ*.

No postfrontal bone; fang grooved.....*ELAPIDÆ*.

A postfrontal bone; fang not grooved in front.....*DENDRASPIDÆ*.

NAJIDÆ.

I. Apex of hemipenis smooth, with circular free margin (disciform).

No solid maxillary teeth; subcaudals one-rowed; hemipenis bifurcate,

Acanthophis Daudin.

II. Apex with calyces (calyculate).

α . Spinous below calyces.

Subcaudals one-rowed; vertebral row enlarged; hemipenis not divided,

Bungarus Daudin.

Subcaudals two-rowed; vertebral row not enlarged; poison gland far posterior; hemipenis not divided.....*Adoniophis* Meyer.

Hemipenis divided; calyces not fringed.....*Sepedon* Merriam.

$\alpha\alpha$. Not spinous below calyces.

Hemipenis bifurcate; calyces fringed; anterior ribs elongate; erectile.

Naja Laurenti.

III. Apex papillose.

Hemipenis simple; urosteges one-rowed; rostral normal. *Hoplocephalus* Cuvier.

Causus and *Atractaspis* are not referred to here, as I showed in 1860 that they are true *Solenoglyphs*.

I now give a synopsis of the genera of *Najidæ* as defined without penial characters.

I. Grooved teeth behind two perforated teeth on the os maxillare. Head shields normal; no loreal; scales smooth; form fusiform *Ogmodon* Peters.¹

II. Solid teeth behind the fang on the os maxillare.

A. Loreal plate present.

Subcaudals entire; scales smooth *Denisonia* Krefft.

AA. Loreal plate absent.

α . The neck with few scales, not extensible.

β . Subcaudal scuta one-rowed.

γ . Scales of vertebral row equal to others.

Nasals two; scales smooth; anal bifid. *Pseudechis* Wagler.

One nasal; scales smooth; anal single. *Hoplocephalus* Cuvier.²

One nasal; scales keeled; anal single. *Tropidechis* Günther.

$\alpha\alpha$. Scales of vertebral line enlarged.

Scales smooth; two nasals; anal entire. *Bungarus* Daudin.

$\beta\beta$. Subcaudal scuta two-rowed.

γ . Scales of vertebral row equal.

Rostral plate normal; two nasals *Diemenia* Gray.³

Rostral plate narrow; produced backward above; two nasals

Pseudonaja Günther.

Rostral wide, prominent, depressed; one nasal

Furina Duméril and Bibron.⁴

Rostral normal; one nasal; anal double. *Cacophis* Günther.⁵

$\gamma\gamma$. Scales of vertebral line enlarged.

Scales smooth *Megarophis* Gray.⁶

$\alpha\alpha$. Neck extensible, covered with more numerous scales.

β . Anal entire; subcaudals two-rowed.

No postparietal plates *Naja* Laurenti.⁷

Postparietals present *Ophiophagus* Günther.

III. No solid maxillary teeth.

α . Subcaudal scuta in two rows.

β . Rostral plate much developed.

Rostral free at the sides; scales keeled. *Cyrtophis* Smith.

Rostral not free; scales smooth; anal entire. *Aspidelaps* Fitzinger.

Rostral not free; anal entire; two nasals *Rhinelaps* Günther.

$\beta\beta$. Rostral not enlarged.

Scales keeled *Sepedon* Merrem.

Scales smooth. *Callophis* Günther.

$\alpha\alpha$. Subcaudal scutellæ in one row.

One nasal; a spine at end of tail. *Acanthophis* Daudin.

¹ *Labionaris* Brocchi.

² *Alecto* Wagler.

³ *Pseudoelaps* Duméril and Bibron. *Elapsoides* Bocage. *Hemibungarus* Peters; includes *Brachysoma triste* Günther.

⁴ *Brachyurops* Günther.

⁵ *Brachysoma* Günther. *Boulengerina* Dollo.

⁶ *Xenurelaps* Günther.

⁷ *Tomyris* Eichwald.

The geographical distribution of the species of this family is as follows:

Paleotropical.	Palaearctic.	Neotropical ne- arctic.	Ethiopian.	Australian.
<i>Ogmodon</i>				<i>Denisonia</i> . <i>Pseudechis</i> . <i>Hoplocephalus</i> . <i>Tropidechis</i> .
<i>Bungarus</i>				<i>Diemenia</i> . <i>Pseudonaja</i> . <i>Furina</i> . <i>Cacophis</i> .
<i>Megacerophis</i>			<i>Cacophis</i>	
<i>Naja</i>	<i>Naja</i>		<i>Naja</i>	
<i>Ophiophagus</i>			<i>Cyrtophis</i>	
			<i>Aspidelaps</i>	
			<i>Sepedon</i>	<i>Rhinelaps</i> . <i>Acanthophis</i> .
<i>Callophis</i>				

It is to be observed that much the largest number of genera belong to the Australian realm. The majority of the species belong also to Australia, the genus *Denisonia* alone including some nineteen species. The genus *Ogmodon* with one species belongs to the Fiji Islands only. No genus or species occurs in the Western Hemisphere, where they are represented by the Elapidæ.

The Najidæ, although of an organization inferior to that of the Solenoglypha, embraces some of the most venomous snakes known to us. Such are the species of *Ophiophagus*, *Naja*, and *Bungarus*, in India, and *Acanthophis* and *Pseudechis* in Australia. The cobra (*Naja tripudians* Linnaeus) causes more deaths than any other snake, not only because of the energy of its venom, but because of its courage and activity. In Australia the *Pseudechis porphyriacus* (the black snake) causes more fatalities than any other. The death adder (*Acanthophis antarctica*) is a dangerous species, but it is less active in its movements. The *Ophiophagus elaps* of India is the longest venomous snake, reaching a length of 12 feet. It is fortunately rare. Many of the smaller Australian Najidæ are not dangerous.

ELAPIDÆ.

The only genera of this family which I have examined are *Elaps* and *Vermicella*. The hemipenis is alike in both; that is, it is bifurcate, with each half with a spinous apex. The extension of the spines downward differs with the species. Thus they extend but a short way in *Elaps corallinus*, but extend far down in *E. surinamensis* and *E. imperator*. The usual definitions of the genera are as follows:

a. Internasal plate touching the nasal laterally.

One nasal plate..... *Vermicella* Gray.

Two nasal plates *Elaps* Schneider.

aa. Internasal reaching first labial plate.

One nasal; no loreal..... *Microsoma* Jan.

The genus *Vermicella* is Australian, *Elaps* is American, and *Microsoma* is African. The genus *Elaps* embraces many species, but the

other two genera are represented by not more than two species each. The species are not dangerous, with the exception of a few of the larger species of *Elaps*.

ELAPS Schneider.

Elaps SCHNEIDER, *Historia Amphibiorum*, II, 1801, p. 289.—DUMÉRIL and BIBRON, *Exp. Gén.*, VII, 1854, p. 1191.—GÜNTHER, *Cat. Col. Snakes Brit. Mus.*, 1858, p. 229.—COPE, *Bull. U. S. Nat. Mus.*, No. 1, 1875, p. 34.

Maxillary bone without solid teeth behind the perforated tooth. Cephalic plates normal; rostral not modified. Two nasal plates; no loreal; oculars few. Scales not keeled, without fossa. Subcaudal scutellæ in two rows; anal plate divided. Pupil a vertical oval. Head little distinct.

This genus embraces from twenty to thirty species of the neotropical realm, three of which have their principal habitat in the southern portions of the nearctic. They are of rather elongate body and short tail, and have small eyes. They approximate in general appearance the Calamarine Colubridæ, so that their discrimination, except on examination of the dentition, from snakes of this group can only be accomplished by experts in species characters. The scutellation of the head is exactly that of the genus *Tantilla*. The coloration is brilliant, consisting of red and black, with less yellow, arranged in rings or parts of rings. The red is generally the ground color, and the black rings are either single or in sets of three. The latter may be much narrower than the ground color, or may be so wide as to reduce it to very small proportions (*E. semipartitus*, *E. imperator*). The epidermis is beautifully iridescent, especially on the black spaces. The colors are much like those of the mineral labradorite, and are probably due to a similar physical cause, namely, a microscopic lamination of the surface. On direct and antero-posterior views the color is peacock purple; on transverse views it passes from brassy yellow through brassy green to maroon and brown. The colors do not appear if the scales are wet.

The bite of some of the larger species, as *E. surinamensis* and *E. marcgravii*, is said to be dangerous, but that of the smaller ones is innocuous to man and the larger animals.

Three species are found within the limits of the nearctic realm, which differ as follows:

- I. Temporal scales, 1-1; a black ring immediately behind head; internasals much smaller than prefrontals.
 - Tail one-seventh to one-eighth total length; black rings wide, covering from 7 to 20 scales; red spaces above and below black-spotted; three or four black rings on tail; muzzle and chin black *E. fulvius*.
 - Tail one-seventh total length; black rings narrow, covering 2-3 scales; red spaces above and below not black-spotted; tail with seven black rings; nose and chin red *E. distans*.
- II. Temporal scales, 1-2; internasals equal or nearly equal prefrontals; a red ring immediately behind head.
 - Tail very short, one-fourteenth total length; black rings 6 or 7 scales wide, with very wide yellow borders; interspaces above and below unspotted; tail with two black rings; nose and chin black *E. curyzanthus*.

ELAPS FULVIUS Linnæus.

Elaps fulvius FITZINGER, N. Class. Rept., 1826, p. 61.—HOLBROOK, N. Amer. Herp., 1st ed., 1838, p. 87, pl. XVIII; 2d ed., III, 1842, p. 49, pl. x.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 21.—DUMÉRIE and BIBRON, Erp. Gén., VII, 1854, p. 1215.—GÜNTHER, Cat. Colubr. Snakes Brit. Mus., 1858, p. 235.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 34.

Coluber fulvius LINNÆUS, Syst. Nat., I, 1766, p. 381.—GMELIN, Linn. Syst. Nat., 13th ed., I, Pt. 3, 1788, p. 1104.

Vipera fulvia HARLAN, Journ. Acad. Nat. Sci. Phila., V, 1827, p. 364.

Elaps tener BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 22.

E. tristis BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 23.

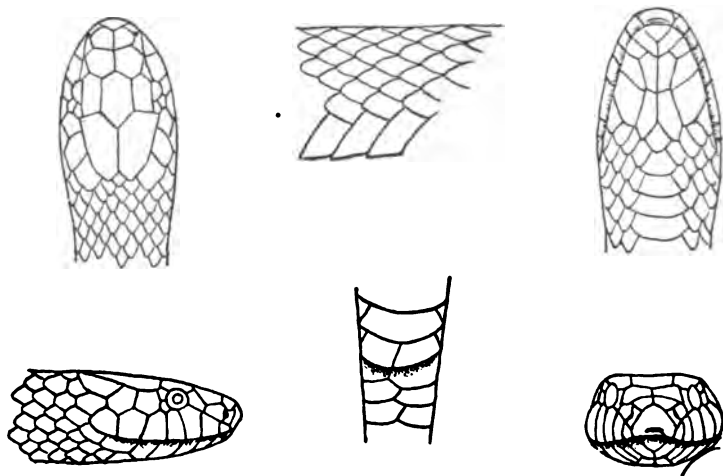


Fig. 321.

ELAPS FULVIUS LINNÆUS.

= 1.

South Carolina.

Cat. No. 8813, U.S.N.M.

Scales in fifteen longitudinal rows rather wide, a little narrower about the median line. Head oval, a little convex laterally; muzzle short, wide; eye very small. Rostral plate not prominent, about as high as wide (excluding notch for tongue). Internasals about one-third the size of the prefrontals. Frontals wider than superciliaries, with straight anterior border, and posterior apex considerably produced between parietals. Parietals short but longer than wide. Prenasal deeper in front than postnasal; postnasal longer, its superior posterior border descending. Oculars, 1-2; preocular with prefrontal border descending forward and meeting prefrontal border of nasal; its superior angle widely removed from the frontal. Superciliary short, truncate anteriorly and posteriorly, but longer than wide. Temporals, 1-1. Superior labials seven, all higher than long except the seventh, which is as long as high; the eye over the third and fourth. Inferior labials seven, the fourth largest. Postgenaeals short, longer than progenaeals.

The tail varies in length from six and two-thirds to eight and one-

fourth times in total length. Baird and Girard give the following numbers of scutellæ and measurements, the latter in inches:

Locality.	Gastroteges.	Trostegea.	Length.	Tail.
Charleston, South Carolina.....	207.	30.	28½.	3½.
Do	205.	39.	22½.	2½.
Do	209.	37.	17½.	1½.
San Pedro of Rio Grande.....	237 +2.	26.	17½.	1½.
New Braunfels, Texas	230 +1.	29.	26.	2.
Do	224 +1.	38.	22.	2½.

The red may be considered as the ground color of the body, though the black rings occupy nearly as much space above as the red, so as to give the general appearance of a succession of red and black rings. The yellow is intermediate. The anterior part of the head from the posterior point of the vertical plate, embracing the orbits, is black, as is also the tip of the lower jaw. A yellow ring passes across the occipital region down to the inferior surface of the head, embracing the space between the posterior rim of the eye and the angle of the mouth. Then comes a black ring, covering eight dorsal scales, margined posteriorly with yellow. From this region to the origin of the tail the

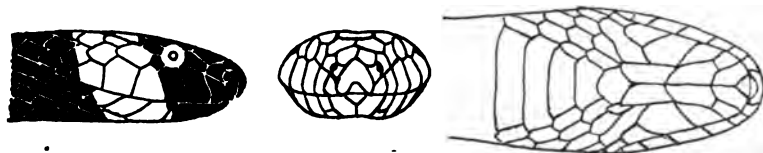


Fig. 322.
ELAPS FULVUS LINNÆUS.
= 1.

black and red rings, from fourteen to nineteen in number each, alternate, being separated from each other by a narrow band of yellow. The black rings cover seven entire scales and two halves, the intermediate red space five entire scales and two halves, and the yellow either one and two half-scales or two halves only. Some red spaces may occasionally cover nine and ten scales. The tail is alternately black and yellow; the first caudal ring is black, and embraces ten scales; the second is yellow, and covers three scales. Two black and two yellow succeed and cover the same ground. The tip of the tail is black on five scales. The tip may be either black or yellow, for, according to the size, there are either three or four black rings. Underneath, the colors are the same, but dull; occasionally one or more black rings may not surround the body. The reddish spaces are irregularly blotched with deep black, as also sometimes on the upper surface.

Specimens from western Texas (Indianola on the Gulf of Mexico and the Pecos River on the north) differ somewhat from those from farther east, and furnished the bases for the supposed species *E. tener* Baird and Girard. Generally the frontal plate is not wider than the superciliary, but in one specimen it is as wide as in the typical form (Cat. No. 8574). The red spaces are more closely spotted and blotched with black, the blotch on the belly being especially large. The yellow bor-

ders are also wider, covering two and one and a half rows of scales, while those of the typical *E. fulvius* cover but one. A specimen from New Orleans is intermediate in these points of coloration (Cat. No. 4804), and in specimens from Pensacola (Cat. No. 8783) and St. Johns River (Cat. No. 8230), Florida, the yellow borders are one and a half and even two scales wide. I do not find the Texan forms to represent a subspecies.

The number of black rings on the body and tail varies within rather narrow limits. I give the following account of them as they occur in fifteen specimens. The first number represents those on the body; the second that on the tail: 11, 3, Cat. No. 8574; 12, 3, Cat. Nos. 6045, 6081, 1137; 12, 4, Cat. Nos. 1135, 4804, 8230; 13-3, Cat. No. 7776; 13-4, Cat. No. 8783; 14, 4, Cat. Nos. 1142, 4716; 15, 4, Cat. Nos. 1120, 10606, 10674; 16, 4, Cat. No. 9933; 17, 4, Cat. No. 8813.

In coloration the *Elaps fulvius* represents the type with single rings in approximation to that with triple rings, since the black spots of the ground color are most dense next the yellow borders, thus foreshadowing narrow rings at these points, such as exist in the *Elaps lemniscatus*.

The *Elaps fulvius* ranges from North Carolina (exclusive) to the Tierra Templada of the State of Vera Cruz, Mexico. A specimen is in the U. S. National Museum from Jalapa.

Elaps fulvius Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4804	1	New Orleans, Louisiana.....	.....	Acad. of Sci., New Orleans	Alcoholic.
4391	1	Arkansas.....	.....	Colonel Kearney.....	do.
6081	1	Jalapa, Mexico.....	.....	R. M. D'Oca.....	do.
1120	1	Charleston, South Carolina.....	.....	Dr. C. Girard.....	do.
6045	1	Barbados.....	.....	Prof. Theo. N. Gill.....	do.
1139	1	Liberty County, Georgia.....	.....	Dr. W. L. Jones.....	do.
1130	1	Eutaw, Alabama.....	.....	Prof. A. Winchell.....	do.
1142	1	Somerville, South Carolina.....	.....	J. C. McNair.....	do.
4716	1	Micanopy, Florida.....	.....	Dr. J. H. Bean.....	do.
7776	1	St. Josephs Island.....	.....	.....	do.
8230	1	Saint John's River (Orange Bluffs), Florida.....	.....	L. W. Ledyard.....	do.
9933	1	Arlington, Florida.....	—, 1878	G. Brown Goode.....	do.
10606	1	Nashville, Georgia.....	Sept. 6, 1880	William J. Taylor.....	do.
8813	1	South Carolina.....	.....	Dr. G. A. Moran.....	do.
10674	1	Arlington, Florida.....	—, 1879	F. C. Goode.....	do.
10673	1	do.....	—, 1879	do.....	do.
11990	1	Georgiana, Florida.....	.....	William Wittfield.....	do.
1135	1	Texas.....	.....	Colonel Jewett.....	do.
10443	1	Gainesville, Florida.....	—, 1880	James Bell.....	do.
1124	1	Kemper County, Mississippi.....	.....	D. C. Lloyd.....	Alcoholic type.
1123	1	Rio Grande.....	.....	General Churchill, U. S. A.....	Alcoholic.
8870	1	Hempstead, Texas.....	Dec. 22, 1876	Kumlien and Bean.....	do.
1119	1	San Pedro to Rio Grande, Mexico.....	.....	.....	do.
1125	2	San Felipe.....	.....	Maj. W. H. Emory, U. S. A.....	do.
1135	1	Texas.....	.....	Colonel Jewett.....	do.
1137	4	Rio Pecos, Texas.....	.....	Capt. John Pope, U. S. A.....	do.
8783	1	Pensacola, Florida.....	Aug. —, 1874	F. Stevenson, U. S. N.....	do.
8574	1	Indianola, Texas.....	Sept. —, 1874	Capt. Wm. Holden.....	do.
14794	.....	Orange, Florida.....	.....	E. H. Park.....	do.
14826	.....	Georgiana, Florida.....	.....	William Wittfield.....	do.
15061	.....	San Diego, Texas.....	.....	William Taylor.....	do.
17025-30	.....	Cameron County, Texas.....	.....	C. E. Worthen.....	do.
17388	.....	Palatka, Florida.....	.....	C. W. Richmond.....	do.
20850	.....	Fort Clark, Texas.....	.....	Dr. E. A. Mearns.....	do.
22699	.....	Fort Bassenger, De Soto County, Florida.....	.....	R. Ridgway.....	do.

Dr. Einar Lønnberg writes of this species as he observed it in Florida as follows:¹

This is the only species of Elaps I have found in south Florida, where it is rather common. It is known under several names, as "coral snake," "American cobra," "garter snake," and "candy stick." It is perhaps the most dangerous snake in Florida, because it is not so much dreaded as the big rattlesnake or moccasin, though being quite as poisonous. As the last mentioned names show, it is regarded as a "pretty little snake." Few people know or believe that it is poisonous, it looks so harmless, and as a consequence they catch it and handle it rather roughly; the snake gets angry, bites, and a human life is endangered. I know personally of such a case. A Swede at Oakland, Orange County, found an Elaps, and because of its beautiful color he caught it and tried to put it into a bottle of alcohol. The snake bit him, but the wound was not large, and as it did not swell he did not care much about it at first. After a while he was taken very sick, went to bed, asked for a physician, and drank whisky; but it was then too late. He died the next morning, about twelve hours after the snake had bitten him. During the last hours he was unconscious, but before that he suffered most excruciating pains. I have heard of several other cases of boys dying from an Elaps bite.

In other cases people have been bitten by an *Elaps fulvius* without suffering from it in any way, but I suppose that in such cases the Elaps had not been able to inject any poison into the wound, as it has a rather small mouth. However that may be, I can not agree with Cope that the bite "of the smaller ones (meaning smaller species of *Elaps*) is innocuous to man and the larger animals." It is to be observed that the Elaps bites differently from the Crotalids and Viperids. The latter snake throws its head forward in striking, and draws it back again immediately. The *Elaps fulvius* I have seen and heard about have acted in an entirely different manner. The poor Swede above mentioned had to pull the snake from the wound, and other specimens that I had induced to bite into sticks kept the stick in the mouth for a good while. This habit probably signifies an intention to press as much poison as possible into the wound, which makes the snake the more dangerous. *Elaps fulvius* is, however, a good-natured snake, and it does not bite unless it is very much provoked. If not handled too roughly, an Elaps may be allowed to crawl on one's hands from one to the other. I have allowed it myself once, but I hardly think I would do it over again, and would not advise anybody else to try it.

I have found *Elaps fulvius* under logs, and digging in the ground as well as crawling about on the surface, but I think it prefers dry land.

The largest specimen I have seen was from Oakland, Orange County, and measured exactly 1 m. from the tip of the nose to the anus, and the tail was 90 mm. This big specimen had fourteen black rings on the body and three on the tail. Other specimens have but twelve black rings on the body and three on the tail, but one of these has four on the tail. The yellow rings cover from one to two rows of scales.

ELAPS DISTANS Kennicott.

Elaps distans KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 338.—COPE, Checklist N. Amer. Batr. Rept., 1875, p. 34.

Body slender, with very narrow black rings, four or five scales in width, separated by intervals, three or four times as wide, of brownish or reddish, entirely unspotted. No light rings separating the red and black ones. Upper lip and jaw wholly without black, and the tip of nose light.

Body very slender; tail one-seventh the length (seven and one-third

¹ Proc. U. S. Nat. Mus., XVII, 1894, p. 334.

times in the total in Cat. No. 8265). Dorsal scales small. Plates of the head generally larger than in *E. euryxanthus*; rostral broad and not as high as in the same. Internasals rather small, and slightly elongated laterally; prefrontals large, pentagonal, as broad as long. Superciliaries quadrangular, elongated, narrow. Frontal pentagonal, rather large, but narrow, the pointed posterior extremity inserted between the occipitals, as in *E. fulvius*.

The ground color of the body in the alcoholic specimen is reddish brown, probably brighter red in life, with twelve to fourteen very narrow, black rings from head to anus. At the edges of the black rings the reddish color becomes indistinctly lighter for half a scale, but there is no well-defined light ring bordering the black as in the other species. On the tail are five to seven broad black bands separated by narrow light rings. The anterior part of the head back to the middle of the occipitals and the upper jaw to the fourth labial is black, but this color does not extend on the lower jaw at all, and the lower edge of the rostral and upper labials is light. On the posterior part of the head is

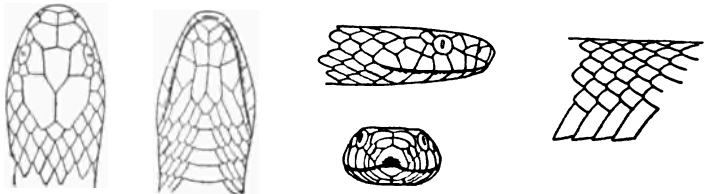


Fig. 323.

ELAPS DISTANS KENNICOTT.

× 1.5.

Cat. No. 8965, U.S.N.M.

the usual light rings, but situated farther back than in *E. fulvius*, its anterior border passing across the middle of the occipitals a little behind the vertical, and thence down and forward to the fourth labial, expanding below upon the whole of the lower jaw. On the neck, behind this light ring, is a black one, about five or six scales in width, which does not run entirely around the body, being interrupted for a short distance on the abdomen. Behind this the black annulations are perfect, each four or five scales in width, and separated by intervals of fifteen to twenty scales of the ground color. The black annulations are broader on the vertebral region than laterally and beneath, where they cover three or four dorsal scales and the same number of abdominal scutellæ. The black rings on the tail are about eight scales wide, and separated by light intervals of only two or three scales.

The narrow black rings, separated by very wide intervals, will at once distinguish this species from any of the others here described. There are also no blotches or dots of black on the red intervals, and if the colors of the specimen described have not been much altered by soaking, the absence of distinct light rings of a third color between

the black and red ones will form a striking character. The color of the light occipital ring and of the light rings on the tail is probably yellow or white in life.

The characters which distinguish this species from the *Elaps fulvius* are those of color only, as in structural characters the two are identical. Many of the species of the genus differ in such characters only, and they are often very constant. The present species displays equal constancy in the known individuals.

Elaps distans Kennicott.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
8369	1	Volusia, Florida	Prof. F. B. Meek	Alcoholic.

The specimen alleged by Dr. Yarrow¹ to have been sent from Chihuahua, Mexico, belongs to the *E. euryxanthus*.

ELAPS EURYXANTHUS Kennicott.

Elaps euryxanthus KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, p. 337.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 34; Proc. U. S. Nat. Mus., XIV, 1892, p. 681.

Head very small, not wider than the neck; entirely black as far back as the angles of the mouth. Body banded alternately with black and light red, separated by narrow rings of creamy white, all the bands immaculate. First broad ring behind the occiput red instead of black as in the other species.

Body rather stout, but less so than in *E. fulvius*. Dorsal scales in fifteen rows, large. Plates of the head small, except the rostral, which is higher than long, and extends upward between the prefrontals. Internasals elongated laterally; more so than in *E. fulvius*. Prefrontals small, elongated laterally; superciliary as wide as long, truncate behind. Frontal very small and narrow, subhexagonal, pointed anteriorly, elongated and tapering posteriorly. It enters but slightly between the parietals. Parietals small, wide, but longer than wide; the anterior edge square, very slightly notched for the vertical. Prenasal deeper than long; postnasal with a border for the preocular. Oculars 1-2; temporals 1-2. Seven labials above; all higher than long, the seventh very short. Tail very short, one fourteenth of total length.

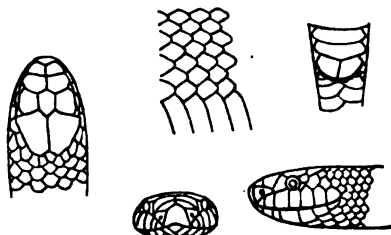


Fig. 324.

ELAPS EURYXANTHUS KENNICOTT.

× 1.5.

Fort Whipple, Arizona.

Cal. No. 8949, U.S.N.M.

¹ Check-list, p. 82.

The forepart of the head is black, but the black, instead of passing forward from the anterior part of the occipitals to near the eye and thus leaving the three posterior labials yellow, as in *E. fulvius* and *E. distans*, involves nearly the whole of the occipitals and passes backward entirely behind the angle of the mouth, and involves the whole of the lower jaw to behind the posterior labial, leaving a broad emargination in the black on the occiput, in the bottom of which emargination are seen the white posterior tips of the occipitals. Behind this is a creamy-white ring (probably yellow in life), which is situated more posteriorly than in *E. fulvius*, and involves only the posterior tip of the occipitals and none of the labials. Next behind this white ring, instead of a black ring as in the other species, is a broad light-brick red one involving eleven scales. A creamy-white ring three and a half scales wide separates this first red ring from a black one eight scales in width. Behind this are alternate immaculate black and red rings seven or eight scales wide, and separated by white rings three to three and a half scales in width. There are eleven black and eleven red rings on the body separated by twice as many white ones. The tail is ringed with black and white, without any red. All the rings run entirely around the body of the same color, and are wholly without spots above and below. The plates of the head and peculiar style of coloration in this strongly marked species can not be mistaken. The three colors, each immaculate, glossy, and clear, form a striking contrast, and the red is probably bright carmine in life, thus affording the most beautiful coloration possessed by any North American snake.

The proportions of the head plates in this species are very different from what is observed in *E. fulvius* and other species, and mark it as one of the most distinct species of the genus. Its geographic range is the Sonoran region, beyond which it has not been found.

Elaps euryxanthus Kennicott.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
1122	1	Sonora, Mexico .....	.....	Dr. Thos. Webb	Alcoholic.
1131	1	Arizona .....	.....	A. Schott	do.
8566	1	Tiburou Island, Lower California	Aug. 22, 1876	Dr. T. H. Streets, U. S. N.	do.
8949	1	Fort Whipple, Arizona .....	.....	E. Palmer	do.
8850	1	Chihuahua .....	.....	Wm. Grant	do.
17790	.....	Fort Huachuca, Arizona .....	.....	Wilcox .....	.....
22194	.....	Fort Bowie, Arizona .....	.....	Fisher	do.
16805	.....	Nogales, Arizona .....	.....	P. L. Jouy .....	.....
21721	.....	Warsaw Mill, Mexican boundary line, Arizona .....	.....	Dr. E. A. Mearns	do.
22194	.....	Fort Bowie, Arizona .....	.....	U. S. Department of Agriculture	do.

Prof. F. Cragin, of Topeka, Kansas, sent me a specimen of this species which he obtained at Guaymas, on the Gulf of California. The specimen Cat. No. 1123 from the Rio Grande River referred to this species by Yarrow¹ belongs to the *E. fulvius*.

¹ Check-list, p. 82.

DENDRASPIDIDÆ.

The single genus of this family is characterized as follows:

Sulcus bifurcate; hemipenis simple, calyculate, becoming spinous at middle; no teeth behind fang; attenuate..... *Dendraspis* Schlegel.

This family includes a half dozen or so of species of the Ethiopian realm. They are of arboreal habits, of green colors, and of elongate form. Their bites are dangerous to men.

PLATYCERCA.

But one family, the Hydrophidæ, is included in this subdivision. I have been able to examine but two genera, *Hydrus* and *Hydrophis*. Specimens of *Platurus* at my disposal are all females.

Hemipenis undivided, spinous to apex, where it is papillose..... *Hydrophis* Daudin.
Hemipenis bifurcate, spinous to apex *Hydrus* Schneider.

From natural characters the genera are defined as follows. The table is mostly compiled from Günther, in the Reptiles of British India:

- I. *Gastrosteges* wide, flat.
Two pairs of frontal shields..... *Platurus* Latreille.
- II. *Gastrosteges* wide, with two keels.
Scales imbricate; one nasal *Aipysurus* Lacépède
Top of head scaly; two nasals *Pelagophis* Peters and Doria.
- III. *Gastrosteges* narrow, rudimentary, or absent.
* Nasals separated by frontals.
Gastrosteges distinct to vent..... *Distira* Lacépède
** Nasals contiguous.
Head covered with scales behind..... *Acalyptus* Duméril and Bibron.
Head short, entirely shielded; no symphyseal notch..... *Hydrophis* Daudin
Head moderate, entirely shielded; a deep symphyseal notch
Enhydrina Gray
Snout long, spatulate..... *Hydrus* Shaw.

The species of this family are aquatic and marine in habitat, and they are found in the seas bounding the Paletropical and Australian realms. One species—the *Hydrus bicolor*—extends its range across the Pacific Ocean and to the coasts of South and Central America, extending as far south as Peru and north to Mazatlan, Mexico. It has not been yet found on the coasts of the United States. Admiral McCauley, U. S. N., informs me that he has sailed through shoals of sea snakes, probably *Hydrus bicolor*, off the coast of Peru. The genus *Hydrophis* is represented by a considerable number of species, while those of the other genera are less numerous. They are mostly dangerous to men who venture into the water which they inhabit. The species of *Platurus* are more terrestrial in their habits and are sometimes found far from the coast. The other species only leave the water to deposit their eggs.

SOLENOGLYPHA.

The families of this suborder are defined as follows:

- Maxillary bone not excavated; fang not grooved in front; no postfrontal bone
 ATRACTASPIDIDÆ Günther.
 Maxillary bone not excavated; fang grooved in front; a postfrontal bone
 CAUSIDÆ Cope.
 Maxillary not excavated; fang not grooved in front; a postfrontal bone
 VIPERIDÆ Gray.
 Maxillary bone excavated by a deep fossa, which opens externally; fang not grooved
 in front; a postfrontal bone CROTALIDÆ Gray.

The penial characters of the Solenoglyphæ are like those of the more specialized members of the Colubridæ, and vary in the same way, except that the sulcus and the organ are always bifurcate.

ATRACTASPIDIDÆ.

The genera of this family are the following:

- Urostegeæ one-rowed; anal entire *Atractaspis* Smith.
 Urostegeæ more or less two-rowed; anal divided *Clothelaps* Cope.¹

The only species in which the hemipenis is known is the *Atractaspis corpulentus* Hallowell. Here the sulcus and entire organ are furcate, and spinous to near the extremity. The latter is furnished with wrinkled laminae which inclose a few irregular calyces at the apex, and below these are transverse farthest from the sulcus, and longitudinal nearest to it. The spines are in longitudinal series. The only species examined (*B. corpulentum* Hallowell) is not deeply bifurcate, and the bifurcation of the sulcus corresponds with that of the organ.

Several species of *Atractaspis* are known from Africa. They are ground snakes of small and medium size and of dark colors. They have the form of some Calamarian genera, with indistinct head and tail and small eyes. They are not reported to be dangerous.

CAUSIDÆ.

- Subcaudals two-rowed; anal entire; scales keeled; rostral prominent, with recurved
 border *Heterophis* Peters.
 Subcaudals and anal plates double; scales keeled; rostral normal... *Causus* Wagler.
 Subcaudals and anal entire; scales smooth; rostral normal, a loreal
 *Dinodipsas* Peters.
 Subcaudals two-rowed; anal entire; scales smooth; rostral normal, a loreal, and
 one nasal plate *Azemiophis* Boulenger.

The only genus which I have been able to examine as to the penial structure is *Causus*. The sulcus and organ are deeply and equally bifurcate, and the branches are extensively calyculate, while the median portions are spinous. The calyculate region is traversed by a deep groove. The calyces are replaced in the groove by depressed laminae. The borders of the calyces are serrate in the *C. rhombeatus*.

¹Type *Atractaspis hildebrandtii* Peters; second species *A. congica* Peters.

The characters are in general like those of the typical *Solenoglyphs*.

The genera of *Causidæ* are Ethiopian, except *Azemiophis*, which is Indian, but has not been found out of Farther India. There are three species of *Causus*, and one each of the other genera. The African genera are *Xenodon*-like in form, and of terrestrial habits, and the species of *Causus* are generally distributed in Africa. None of the species of the family reach a large size.

VIPERIDÆ.

I. Urosteges two-rowed.

α. Apex of hemipenis calyculate.

No flosses; calyces deeply fringed *Vipera* Laurenti.

"Nostril between three plates" Günther *Daboia* Gray.

No flosses, calyces moderately fringed; nostril surrounded by scales and a supranasal; no supraocular nor nasal horns *Bitis* Gray.

Flosses, spines below flosses; apex with calyces not fringed; nostril surrounded by scales and a supranasal, some of which are produced into horns *Clotho* Gray.

α α. Apex of hemipenis spinous.

Nostril surrounded by scales and a nasal; horn-like supraocular scales

Cerastes Wagler.

II. Urosteges one-rowed.

Body and tail cylindrical *Echis* Merrem.

Body and tail compressed and prehensile *Atheris* Cope.

I am unacquainted with the penial structure of the last two genera.

The *Viperidæ* are restricted to the Old World; that is, to the Palearctic, Paletropical, and Ethiopian regions. The genera are distributed as follows:

Palearctic.	Paletropical.	Ethiopian.
<i>Vipera</i>	<i>Daboia</i>	<i>Cerastes</i> .
		<i>Bitis</i> .
		<i>Clotho</i> .
	<i>Echis</i>	<i>Echis</i> .
		<i>Atheris</i> .

The genera *Vipera* and *Cerastes* approach close to the confines of the Paletropical in western Asia. Africa has the greatest number and the most formidable species. The best known are the puff adder, *Bitis arietans*, and the rhinoceros vipers, *Clotho rhinoceros* and *C. nasicornis*. These are large and brightly-colored snakes, of most dangerous character. The two Indian species are even better known for the fatalities they occasion. These are the *Daboia russellii*, or Tiepolonga, and the *Echis carinata*, or Krait. The *Daboia* is a robust snake of medium size, handsomely ornamented with a pattern of large spots in brown and yellow. The Krait is a very small snake of a light brown, with pale spots and delicate lines marking the keels of the scales on the back. By reason of its small size it is easily overlooked, and as it is extremely venomous, it causes many deaths in India. It makes a scraping or rustling noise by folding itself and rubbing the scales of its body

together. The species of *Cerastes* are mostly dwellers in the deserts of Africa, Arabia, and Persia, and, like other desert forms, they are of pale colors. They have also horny processes, chiefly from the superciliary region, agreeing in this respect also with the spiny character of many desert reptiles and plants. The species of *Cerastes* are of small size, and are very poisonous. The species of *Vipera* are not numerous, and are distributed in Europe and western and northern Asia. The *V. berus* Linnaeus is the common viper of northern Europe, and the *V. aspis* is the asp of Mediterranean countries. The *V. ammodytes*, or sand viper, of the latter region has a considerable production of the rostral plate, so as to simulate a tactile organ.

The African tree vipers belong to the genus *Atheris*. They are of rather small size and of bright green and yellow colors, so as to be readily concealed in foliage. Their tails are especially prehensile, like those of the Boidæ. Four species are known.

CROTALIDÆ.

In the Crotalidæ we have the highest efficiency of the venom apparatus, and therefore the most specialized type of snake structure. The species are predominately American, but a number are found in the Paletropical region, a distribution which is almost unparalleled among vertebrates. The genera are distributed as follows. None are found in the Australian or Ethiopian realms:

Paletropical.	Palearctic.	Neartic.	Neotropical.	Ethiopian.
<i>Lachesis</i>			<i>Lachesis</i>	
<i>Peltopeltor</i>			<i>Bothriopsis</i>	
	<i>Trigonocephalus</i>		<i>Bothriechis</i>	
<i>Calloselasma</i>			<i>Telemaspis</i>	
			<i>Ophryacus</i>	
		<i>Ancistrodon</i>		
		<i>Sistrurus</i>		
		<i>Crotalus</i>	<i>Crotalus</i>	

Of the above genera, *Lachesis* embraces the larger number of species, and they occur in the Neotropical region everywhere, as well as in India and Indo-Malaysia. Two especially dangerous species occur in America—the *L. atrox*, of the mainland, and the *L. lanceolatus* (Fer de Lance) of some of the southern islands of the West Indies. Some of the species are more or less arboreal, as *L. bicolor*, of Brazil, and are of green colors, while those which live on the ground are of brown hues. The Indian species are largely green in coloration. In *Ophryacus* and *Teleuraspis* we have species with tegumentary processes above the eyes.

The *Teleuraspis schlegelii* of Central America is an arboreal form, which is often found wound around the stems in the center of banana bunches. In handling the bunches men are frequently fatally bitten. The species of *Bothriechis* are also arboreal, and those of *Bothriopsis*

are terrestrial. *Lachesis* includes a few species of large size, and the caudal apex is much produced in anticipation of the rattle of the true rattlesnakes. In *Ancistrodon* we have robust species of the ground, the *A. piscivorus* being, however, largely aquatic in habit. It is one of the largest of the family. *Sistrurus* includes a few rather small species, which prepare the way for the true rattlesnakes. The latter are principally abundant in species in North America and northern Mexico. The heaviest of all venomous snakes is the *Crotalus adamanteus* of the southern regions of North America, which attains a length of 8 feet. Its bite is generally fatal. Other large and dangerous species are the *C. molossus* of the United States and Mexican boundary region, and the *C. durissus*, which inhabits the warmer regions of the Neotropical realm.

Two subfamilies are readily distinguishable, namely:

No jointed epidermal caudal appendix.....	<i>Lachesis</i> æ.
A jointed epidermal structure at the extremity of the tail.....	<i>Crotalina</i> æ.

LACHESINÆ.

The genera of this subfamily are as follows:

α. Urosteges two-rowed.

- Top of head scaled; urosteges four-rowed at end; a caudal spine... *Lachesis* Wagler.
- Like *Lachesis*, but a spinous scale over the eye..... *Ophryacus* Cope.
- Top of head with large imbricate shield-like scales..... *Peltepor* Günther.
- Top of muzzle scaled; rest of head shielded..... *Hypnale* Cope.
- Top of head with nine shields; scales carinate..... *Trigonocephalus* Oppel.
- Top of head with nine shields; scales smooth..... *Calloselasma* Cope.¹

αα. Urosteges one-rowed.

- Body and tail cylindric, not prehensile; head scaly..... *Bothriopsis* Peters.
- Body and tail compressed, prehensile; head scaly; scales normal,
Bothriechis Peters.
- Body and tail compressed, prehensile; head scaly; a row of scales outside the
superciliary shield..... *Teleuraspis* Cope.
- Body and tail not prehensile; nine normal head-shields... *Ancistrodon* Beauvois.

The genera of the above series which I have examined are *Cophias*, *Ophryacus*, *Bothriopsis*, *Teleuraspis*, *Ancistrodon*. In all the hemipenis is calyculate, excepting in *Ancistrodon*, which is flounced, with a tendency to form calyces opposite the sulcus in *A. piscivorus*.

ANCISTRODON Beauvois.

Ancistrodon BAIRD, Serpents N. Y., 1854, p. 13.—COPE, Proc. Acad. Nat. Sci. Phila., 1859, p. 336; Check-list N. Amer. Batr. Rept., 1875, p. 34.

Aγκistrodon BEAUVOIS, Trans. Amer. Phil. Soc., IV, 1799, p. 381.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 17.—COPE, Bull. U. S. Nat. Mus., No. 32, 1887, p. 63.

Cenchris DAUDIN, Hist. Nat. Reptiles, V, 1803, p. 358.—WAGLER, Nat. Syst. Amphib., 1830, p. 175.

Toxicophis TROOST, Ann. Lyc. Nat. Hist. N. Y., III, 1833, p. 190.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 19.

¹ *Leirolepis* Duméril and Bibron, not of Cuvier.

Nine symmetrical plates on top of the head, the superciliary bounding the orbit above. Nasal plates, two. Scales keeled, bifossate. Anal plate and caudal scuta undivided. No rattle. Body and tail cylindric.

Three species of this genus are known, two of which belong to the Nearctic and one to the northern part of the Neotropical realm. They are snakes of robust habit and their bite is highly dangerous. One is terrestrial in habit and the other semiaquatic. They differ as follows:

I. No loreal; two small plates behind the parietals; eye resting on labials.

Scales in 25 rows; brown, with broad blackish-brown cross-bands with zigzag borders, and the lateral centers pale and with a median dark spot; a light stripe from superciliary plate and one from below eye, which reaches labial border of last upper labial *A. piscivorus*.

II. Loreal present; no plates behind parietal; eye separated from labials by scales.

Scales in 25 rows; dark grayish with brown cross-bands, wide on the middle line, and with imperfect yellow borders; belly black, with transverse yellow spots on the sides; a yellow stripe from end of muzzle and superciliary plate; and thin yellow stripe on borders of rostral plate and through centers of superior labials *A. bilineatus*.¹

Scales in 23 rows; grayish, with copper-colored cross-bands much narrowed on the middle line, and with pale centers laterally; no stripes on head, but a color border from middle of orbit to top of last upper labial; belly whitish, with black spots on sides *A. contortrix*.

Baird and Girard have proposed to separate the *A. piscivorus* as type of a genus *Toxicophis*, on account of the presence of a pair of post-parietal scuta and the absence of loreal. The *A. bilineatus* is, however, intermediate between that species and the *A. contortrix* in having traces of the postparietals and a loreal plate.

Several characters are common to the species of *Ancistrodon*, which are also found in other genera of Crotalidæ. As in all genera with scuta on the top of the head, the superior plane of the muzzle makes a right angle with the sides, forming a strong canthus rostralis, which is continued around the apex of the rostral plate. The fossæ of the epidermal scales are situated farther back than in the genera of the harmless snakes, and a small tuberosity of the true scale fits into each of them. There are frequently several divided urosteges near the end of the tail, but their number is irregular, and they are sometimes absent, as in *Ancistrodon contortrix*, Cat. No. 10361. The last of the caudal vertebræ consists of an osseous splint with acute apex, which is ensheathed in three modified scales, two above and one below, which is better developed than in most harmless snakes. This process is thrown into rapid vibration when its possessor is alarmed, and produces a buzzing sound when among dry leaves or other objects. It foreshadows the rattle of the Crotali. It is especially developed in the Neotropical genus *Lachesis*. It is variable in size in the *Ancistrodons*.

¹*Ancistrodon bilineatus* Günther, Ann. Mag. Nat. Hist., (3) XII, 1863, p. 364. The U. S. National Museum possesses two specimens from Tehuantepec (west side), Mexico, from Francis Sumichrast. The largest is equal to an average sized *Ancistrodon contortrix*.

ANCISTRODON PISCIVORUS Lacépède.

- Ancistrodon piscivorus* COPE, Proc. Acad. Nat. Sci. Phila., 1859, p. 336; Check-list N. Amer. Batr. Rept., 1875, p. 34.
Crotalus piscivorus LACÉPÈDE, Hist. Serp., II, 1787, p. 424.
Scytalus piscivorus LATREILLE, Hist. Nat. Reptiles, III, 1801, p. 163.
Natrix piscivorus MERREM, Tentamen, 1820, p. 131.
Coluber aquaticus SHAW, Gen. Zool., III, 1802, p. 425, pl. 3 (from Catesby's Water Viper, Carol., II, 1754, pl. XLIII).—DAUDIN, Hist. Rept., V, 1803, p. 344.—HARLAN, Med. Phys. Res., 1835, p. 129.
Trionocephalus piscivorus HOLBROOK, N. Amer. Herp., III, 1842, p. 33, pl. VII.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 1492.
Toxicophis piscivorus BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1., Serp., 1853, p. 19.

No superior loreal. Inferior wall of orbit bounded by third labial; twenty-five dorsal rows of scales. Dark chestnut-brown, with indistinct vertical dark bars. Line from superciliary along the edge of the head through the middle of the temporal scales. A second line, from the lowest point of the orbit, parallel to the first, across the superior labial plates.

Scales all wide and strongly keeled, including those on the sides and back of head, except the inferior row of temporals, which are smooth. First row of dorsal scales with weaker keels than other rows. Two nasal plates with the nostrils between them, the anterior deeper, the posterior longer. Internasals two, one above the other; the upper extending from the eye to the posterior nasal, the lower linear and forming the upper wall of the pit. Lower and posterior wall of pit constituted by a narrow plate (inferior loreal) resting along the third labial and terminating on the second. Second superior labial elevated, forming the anterior border of the maxillary fossa and of its superior anterior angle, the largest narrowing upward, and third labial constituting the inferior wall of the orbit, of which three scales form the posterior wall. Upper labials eight, large and broad; the first and eighth longer than high, the others higher than long; lower labials eleven, fifth largest; seventh to tenth deeper than long. Postgenaeals much shorter than pregenaeals, separated by two scales. Parietals succeeded each by a triangular plate, which is rather smaller than an internasal. Temporals 6-5, 5-4, 6-5, the inferior row much the largest.

General color dark chestnut brown, with darker markings. Head above, purplish black. An obsolete chestnut-brown streak passes from the posterior end of the superciliary along the upper edge of the head through the middle of the second row of supralabial scales. A narrow yellowish-white line passes from the third labial, or begins just below the lowest part of the orbit, and passes backward parallel with the first stripe on the side of the neck, where it is confluent with the yellowish white of the throat. On the lower labials are three short, nearly vertical light bars on the fourth, sixth, and seventh; the rest of the jaw itself, as well as the interval between the stripes on the sides

of the head, dark purplish-brown, of which color is also the space in front and below the eyes. General color above dull dark chestnut brown. On each side a series of twenty or thirty narrow vertical purplish black bars one or two scales wide. Of these sometimes two contiguous to each other on the same side are united above into an arch, inclosing a space the center of which is rather duskier than the ground

color; at others corresponding bars from the opposite sides unite and form half-rings, encircling the body; sometimes there is a lighter shade bordering the dark bars. Beneath black, blotched with yellowish white.

Baird and Girard record a specimen from Prairie Mar Rouge, Louisiana, which had 140 gastrosteges, 24 single and 21 double urosteges.

Measurements.—Length, 22½ inches; tail, 3½ inches.

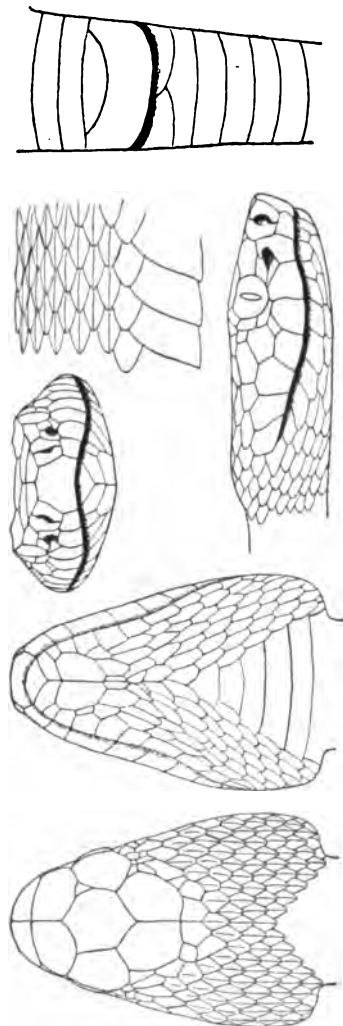


FIG. 325.
ANCISTRODON PISCIVORUS LACÉPÈDE.
X 66

Cat. No. 8946, U.S.N.M.

Cat. Nos.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.
834..	134 + 1.	14 + 33.	1120.	150.
6248.	132 + 1.	33 + 13.	1135.	167.

In some specimens from western Texas the superior labial plates have a slight anterior position at the expense of the second, which is somewhat narrowed, especially toward the labial border. In one specimen (Cat. No. 822) this plate is a triangle with the apex downward, which does not reach the labial border. In another it enters the border by a narrower edge than in typical forms. The character is thus variable. The same displacement of the labials brings the fourth labial into the border of the orbit by a short edge in some

specimens, but this character is also quite inconstant. On such specimens Baird and Girard proposed their *Toxicophis pugnax*, but under the circumstances the form does not seem to be distinguishable.

In the young of the *Ancistrodon piscivorus* the colors are brighter, more contrasted, and the pattern therefore more distinct.

The "moccasin" or "cotton mouth" is a well-known inhabitant of the

Austroriparian region, having a range about equivalent to that of the *Siren lacertina*, and thus characterizing the region. It extends from southeast Virginia to the Rio Grande and throughout Florida. It ascends the Mississippi to middle Illinois and the Ohio to the Wabash River. It inhabits swamps and the borders of water courses, and catches fishes with ease. It generally seeks the water on being disturbed, but will turn on the pursuer if cornered. Its bite is very dangerous. When about to strike it displays the white interior of its mouth for a short time; hence the name "cotton mouth." In spite of its size and dangerous character fatalities from its bite are less frequent than those occurring from the bites of other *Crotalidæ* which inhabit places more used by man.

Ancistrodon piscivorus Lacépède.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
6248	1	Newbern, North Carolina.	.....	.....	Alcoholic.
833	2	New Orleans, Louisiana.	.....	Acad. Nat. Sci., New Orleans.	do.
809	1	Charleston, South Carolina.	.....	.....	do.
817	1	St. Simon's Island, Georgia.	.....	J. P. Postell.	do.
819	1	Fort Smith, Arkansas.	.....	Dr. B. F. Shumard.	do.
824	1	Union County, Illinois.	.....	R. Kennicott.	do.
825	1	do.	.....	do.	do.
9006	1	Montgomery, Alabama.	May —, 1877	Kumlien and Bean.	do.
10551	1	Gainesville, Florida.	Apr. 18, 1881	James Bell.	do.
10441	1	do.	May —, 1880	do.	do.
10442	1	do.	May —, 1880	do.	do.
808	1	Prairie Mer Rouge, Louisiana.	.....	J. Fairie.	do.
9097	1	Wilmington, North Carolina.	.....	.....	do.
10679	1	Clearwater, Florida.	— —, 1879	S. T. Walker.	do.
10734	1	do.	July 14, 1879	do.	do.
10702	1	Gainesville, Florida.	.....	James Bell.	do.
10488	1	do.	July —, 1880	do.	do.
4262	2	Indianola, Texas.	.....	Col. J. D. Graham, U. S. A.	do.
822	1	Near 32° latitude	.....	Capt. John Pope, U. S. A.	do.
4263	1	Eagle Pass, Texas.	.....	A. Schott.	do.
17968	.....	Hopedale, Arkansas.	.....	O. F. Hay.	do.
19056	.....	Mobile, Alabama.	.....	Julius Hurter.	do.

ANCISTRODON CONTORTRIX Linnaeus.

- Ancistrodon contortrix* BAIRD, Serp. N. Y., 1854, p. 13.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 34.
- Agkistrodon contortrix* BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 17.
- Bon contortrix* LINNÆUS, Syst. Nat., I, 1766, p. 373.—GMELIN, Linn. Syst. Nat., 13th ed., I, 1788, Pt. 3, p. 1082.
- Agkistrodon mokeson* PAL. DE BEAUVOIS, Trans. Amer. Phil. Soc., IV, 1799, p. 381.
- Cenchrus mokeson* DAUDIN, Rept., V, 1853, p. 358, pl. XL, fig. 3.—HARLAN, Med. Phys. Res., 1835, p. 128.
- Scytalus cupreus* RAFINESQUE, Amer. Journ. Arts. Sci., I, 1834, p. 85.—HARLAN, Med. Phys. Res., 1835, p. 130.
- Trionocephalus cenchrus* SCHLEGEL, Ess. Phys. Serpens, II, 1837, p. 553, pl. xx, figs. 10, 11.
- Trionocephalus contortrix* HOLBROOK, N. Amer. Herpt., III, 1842, p. 39, pl. VIII.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 1494.

General form robust, but less so than in the *A. piscivorus*. Rostral plate truncate above and not appearing on the superior face of the muzzle, the lateral borders a little concave. Prefrontals much larger than internasals. Frontal about as long as wide, the lateral borders about as long as the superciliary borders. The superciliary plates are large, and extend both anterior and posterior to the frontal. Occipitals shorter than parietals, and longer than frontal, and longer than wide. Prenasal about as long as postnasal and much deeper. Loreal as deep as long, its superior border shorter than the inferior. Three preoculars, the superior the largest, longer than deep, and sometimes touching the postnasal above the loreal. Middle preocular narrow and bounding the pit above, cutting off the loreal from its border. Inferior preocular minute, followed anteriorly by the narrow inferior loreal which bounds the pit below. Superior labials generally eight, but frequently seven, the deficiency in number, when present, posterior to the orbit. Second superior labial twice as high as long, bounding the pit in front and

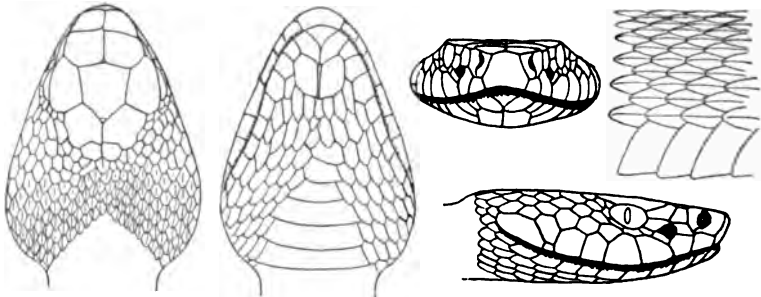


Fig. 3.6.

ANCISTRODON CONTORTRIX LINNÆUS.

= 1.

Cat. No. 13450, U.S.N.M.

reaching the loreal and middle preocular above. Third labial subtriangular. Postocular scales three, suboculars two, all small. Temporals 5-6, all smooth; those of the inferior row a little smaller than the labials, the row succeeding upward a little smaller, the rest quite small. Scales of the occiput and nape small, the former smooth, the latter weakly keeled. Inferior labials ten, fourth largest; those following longer than deep. Genaials very short, the posterior shorter and separated by scales.

The body scales are in twenty-three rows and all are keeled, but the first row very indistinctly, the development of the keels increasing upward. Those of the first row are rounded, and they become more angulate in successive rows to the median line; but they are not narrowed at the latter region.

Above light hazel brown, rather brighter on the top of the head, and everywhere minutely mottled with very fine dark points. On each side is a series of 15-26 darker chestnut-colored blotches resting on the

abdominal scutellæ, and suddenly contracting about the middle of the side, so as somewhat to resemble an inverted Y. These blotches extend to the vertebral line, where they may be truncated or end in a rounded apex. Generally those of opposite sides alternate with each other, but frequently they are confluent above, forming continuous bands. They are so disposed that the intervals between the successive blotches are pretty much of the same shape and size, though inverted. The centers of the blotches are lighter; in some cases so much so as greatly to increase the Y-shaped resemblance. Color beneath dull yellowish, with a series of distinct large dark blotches, 35-45 in number, on each side. Chin and throat unspotted. Sides of head cream color; the line of demarcation very distinct; this passes along the upper edge of the head, in front of the eye, and involving the lower three-fourths of the orbit, intersects the middle of the second postorbital plate (counting from above), and extends along the first row above the labials to the posterior edge of the last labial; the line then comes back through the middle of the lower labial range, where it is marked by a narrow black line. Rostral of the same color. A small areolated dark spot near the inner edge of each occipital plate.

Baird and Girard give the following scutal formulæ and dimensions, the latter in inches:

Locality.	Gastrostegeæ.	Urostegeæ.	Scales.	Length.	Tail.
Cleveland, Ohio.....	153.	40 + 10.	23.	27½.	3½.
Do.....	152.	42 + 10.	23.	29.	4½.
Foxburg, Pennsylvania.....	152.	32 + 18.	23.	26½.	3½.
Do.....	152.	32 + 18.	23.	32½.	4½.
Do.....	150.	48.	23.	7.	3½.
Carlisle, Pennsylvania.....	154.	42.	23.	22½.	2½.
Do.....	154.	48.	23.	28½.	4½.
Charleston, South Carolina.....	150.	40 + 8.	23.	24½.	3½.
Prairie Mer Rouge, Louisiana.....	153.	40 + 8.	23.	20½.	2½.
Do.....	150.	30 + 18.	23.	20½.	3.
Between Indianola and San Antonio.....	150.		23.		
Sabinal.....	150.	31 + 17.	23.	11½.	1½.

In eleven specimens six have the superior labials 8-8; two have them 7-8; and three have them 7-7. The reduction to seven may be regarded as abnormal, since in that case there is generally irregularity. It arises sometimes from the fusion of the seventh and eighth plates, and sometimes from the exclusion of the sixth or seventh from the labial border by contraction below. In the latter case the plate becomes subtriangular and resembles a temporal. The modification is of the same character as that which sometimes affects the second superior labial in the *A. piscivorous*.

The "copperhead" is distributed from Massachusetts to the Rio Grande, throughout the entire eastern and austroriparian regions, following up the river valleys into the eastern part of the central region. It

¹ Blotches larger and fewer, about fifteen in number, and running more upon the abdomen. Vertical plate larger and more acute posteriorly.

is said to prefer meadows and low-lying ground, and is hence frequently met with by the dwellers in such situations. It is a dangerous snake, and causes serious injury and frequently death by its bite. Its numbers are, however, much reduced. It finds concealment in the rocky parts of the country, and still remains in the trap ridges of the Connecticut Valley in Massachusetts and Connecticut. This snake has, like many others, the habit of rapid vibration of the end of the tail when alarmed, and the horny spinous apex buzzing among dry leaves resembles no little the warning noise of the rattle of the *Crotalus*. Harmless snakes fear it, but some of them devour it. Professor Ver-
rill, of Yale University, informs me that a black snake (*Bascanium constrictor*), brought to him from near New Haven, Connecticut, vomited a well-grown copperhead.

Anistrodon contortrix Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
808	1	Prairie Mer Rouge, Louisiana.		J. Fairie.	Alcoholic type.
559	1	do		do	Alcoholic.
569	1	Red River, Arkansas		Dr. L. A. Edwards, U. S. A.	do.
7811	1	Fort Riley, Kansas		Dr. B. J. D. Irwin, U. S. A.	do.
570	1	Big Blue River, Kansas		W. S. Wood	do.
5483	1	Grand Coteau, Louisiana.		St. Charles College	do.
582	1	Mississippi		Dr. J. G. Cooper	do.
586	1	Carlisle, Pennsylvania.		Prof. S. F. Baird	do.
571	1	Sabinal		Col. J. D. Graham, U. S. A.	do.
575	1	Madison, Virginia.		Dr. C. Girard	do.
8047	1	Washington, District of Columbia.		Dr. E. Coues, U. S. A.	do.
574	1	Charleston, South Carolina.		Dr. C. Girard	do.
563	1	do			do.
8788	1	Augusta, Georgia		William Phillips	do.
8365	1	Ferry Landing, Virginia	May 29, 1875	H. W. Welsher	do.
9000	1	Wilmington, North Carolina.			do.
9957	1	Arkansas	—, 1875	Capt. J. P. McCowan, U. S. A.	do.
9210	1	Charleston, South Carolina.		St. Charles College	do.
10361	1	Leesburg, Virginia	Sept. —, 1879	C. S. Carter	do.
10075	1	Florida	—, 1879	J. W. Milner	do.
9685	1	Virginia	May 21, 1878	F. H. Cushing	do.
10361	1	Leesburg, Virginia	Sept. —, 1879	C. S. Carter	do.
15531		Bernadotte, Fulton County, Illinois.		Dr. W. S. Strode	do.
15553		Cook County, Texas		G. H. Ragsdale	do.
16240		St. Louis, Missouri		Julius Hurter	do.
17280		Great Falls, Maryland		C. W. Richmond	do.
17281		Washington, District of Columbia.		do	do.
19261		St. Elizabeth's Asylum, District of Columbia.		Dr. J. W. Blackburn	do.
19068-9		Culpeper County, Virginia.		Albert E. McConnell	do.
22336		Orange Hammock, De Soto County, Florida.		William Palmer	do.
22679		St. Elizabeth's Asylum, District of Columbia.		Dr. J. W. Blackburn	do.
14843		Gainesville, Florida		James Bell	do.
18013		St. Louis, Missouri		Julius Hurter	do.

CROTALINÆ.

Only two genera of this subfamily are known.

Head with nine normal shields.....*Sistrurus* Garman.
 Head scaled above.....*Crotalus* Linnaeus.

In *Sistrurus* the hemipenis is finely flounced as is *Ancistrodon* adding this point of resemblance to the possession of similar head-shields. In *Crotalus* the organ is strongly calyculate, the lower rows becoming flounces in *C. basiliscus* and *C. confluentus*, but not in *C. horridus*, *C. durissus*, nor *C. molossus*. My statement that the spines are not ossified in the *C. durissus*, is due to the fact that I examined a specimen not fully grown, although it was not a very small one.¹

This subfamily is characteristically Nearctic. There is but one species (*Crotalus terrificus*) which is characteristically Neotropical, and there are two other Crotali (*C. lugubris* and *C. basiliscus*) which may range into the Neotropical. A *Sistrurus* (*S. ravus*) may overlap in the same way. The greater number of species belong to the Sonoran region.

The geographical distribution of the Crotalinæ is exhibited as follows—the genus *Ancistrodon* is added in illustration:

Eastern.	Austroriparian.	Central.	Pacific.	Sonoran.	Cape St. Lucas.	Central American.	Columbian.	Brazilian.
<i>Ancistrodon</i> contortrix.	<i>Ancistrodon</i> contortrix							
	<i>A. piscivorus</i> .					<i>A. bilineatus</i> .		
<i>Sistrurus</i> catenatus.	<i>S. nullarius</i> .			<i>Sistrurus</i> <i>ravus</i> .				
<i>Crotalus</i> horridus.	<i>Crotalus</i> horridus.			<i>C. adamanteus</i> scutellatus.				
	<i>C. adamantinus</i> .			<i>C. adamantus</i> atrox.	<i>C. adamantus</i> atrox.			
		<i>Crotalus</i> <i>confluentus</i> .	<i>C. confluentus</i> <i>lucifer</i> .	<i>C. confluentus</i> <i>ruber</i> .				
				<i>C. c. pulverulentus</i> .				
				<i>C. polyactictus</i> ...				
				<i>C. triseriatus</i> ...				
				<i>C. tigris</i> ...	<i>C. enyo</i> ...			
				<i>C. pricei</i> ...				
				<i>C. lepidus</i> ...				
				<i>C. mitchellii</i> ...	<i>C. mitchellii</i> .			
				<i>C. cerastes</i> ...				
				<i>C. basiliscus</i> ...				
				<i>C. molossus</i> ...				
						<i>C. durissus</i> .	<i>C. durissus</i> .	<i>C. durissus</i> .
								<i>C. terrificus</i> .

¹ The structure of the organ is represented on pl. xxxiii, fig. 11, Trans. Amer. Phil. Soc., XVIII, 1895.

SISTRURUS Garman

- Sistrurus* GARMAN, N. Amer. Reptiles, 1883, p. 110; Science, XIX, 1892, p. 290.—STEJNEGER, Report U. S. Nat. Mus., 1893 (1895), p. 410.—W. E. TAYLOR, Amer. Nat., 1895, p. 283.—BOULENGER, Cat. Snakes Brit. Mus., 2d ed., III, 1896, p. 569.
- Crotalus* LINNÆUS, part, Syst. Nat., 12th ed., 1766, p. 372.—GMELIN, Linnæus Syst. Nat., I, 1788, p. 1080.—BONNATERRE, Ophiologie, 1790, p. 1.—MERREM, Tent. Syst. Amphib., 1820, p. 156.—BOIE, Isis von Oken, 1827, p. 562.
- Crotalophorus* GRAY, Ann. Philosophy, 1820, p. 205; not of Linnæus nor Houttuyn; Cat. Brit. Mus., 1849, p. 17.—HOLBROOK, N. Amer. Herp., III, 1842, p. 25.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 11.
- Caudisona* FITZINGER, Neue Class. Rept., 1826, p. 63.—WAGLER, Nat. Syst. Amphib., 1830, p. 176.—BONAPARTE, Saggio, 1832, p. 24.—GRAY, Zool. Misc., 1842, p. 51.—FITZINGER, Syst. Rept., 1843, p. 29.

Tail with a rattle at extremity. Head with nine symmetrical plates above. Nostril between two plates. Urosteges undivided. Scales carinated.

This genus, as is immediately perceived, differs from *Crotalus* only in the possession of the nine cephalic scuta common to most harmless snakes, the *Proteroglypha*, and the genera *Trigonocephalus* and *Ancistrodon* in *Crotalidæ*. The species do not reach so large a size as those of *Crotalus*, and they are hence less dangerous. Their range is also more restricted, since no species is known from South America or Mexico south of Vera Cruz.

Three well-defined species are known, which differ as follows:

- Rostral plate wider than high, recurved above; canthus rostralis obscure; loreal separating nasal and preocular; head not banded; dorsal spots few, longer than wide; rather medium *S. ravus*.¹
- Rostral plate higher than wide, not recurved above; canthus rostralis sharp; loreal separating nasal and preocular; rattle minute; head banded; light stripe commencing at eye; dorsal spots, many *S. miliarius*.
- Rostral plate higher than wide, not recurved above; canthus rostralis sharp; nasal and preocular in contact; rattle larger; head banded; light stripe beginning at nasal plate; two light stripes below fossa; dorsal spots, many *S. catenatus*.

These three species occupy three distinct regions. The *S. ravus* belongs to the Tierra Caliente of eastern Mexico; the *S. miliarius* to the Austroriparian region of North America, and the *S. catenatus* to the eastern region, except that part of it that lies east of the Alleghany

¹ *Caudisona rava* Cope, Proc. Acad. Nat. Sci. Phila., 1865, p. 191. The types came from the State of Vera Cruz and belong to the National Museum. A larger specimen in my private collection came from either the State of Vera Cruz or Puebla (Proc. Amer. Phil. Soc., XXII, 1885, p. 382). The frontal plate is narrowed behind, and the parietals are about the size of the superciliaries. Rows of scales, 21; superior labials, 12; gastrosteges, 144; urosteges, 28. There are but twenty-six spots on the middle line of the body; they are parallelogrammic, or longer than wide. A single rounded spot is opposite each of them on the sides; no alternates. Belly clouded on the end of the gastrosteges. Head uniform light brown, with only a brown spot on each side the nape.

Measurements.—Length, 567 mm.; tail, 45; rattle, 12 mm., with seven joints and a button. In the types there are twenty-three rows of scales.

Mountains. The species do not occur on the dry plains of the interior, nor in the Pacific region; a subspecies of the *S. catenatus* ranges west to Arizona.

SISTRURUS MILIARIUS Linnaeus.

- Sistrurus miliarius* GARMAN, N. Amer. Rept., 1883, p. 110.—STEJNEGER, Report U. S. Nat. Mus. for 1893 (1895), p. 418, pl. VII.—BOULENGER, Cat. Snakes Brit. Mus., III, 1896, p. 569.
- Crotalus miliarius* LINNÆUS, Syst. Nat., 12th ed., I, 1766, p. 372.—GMELIN, Linn. Syst. Nat., I, 1788, p. 1080.—LACÉPÈDE, Hist. Serp., II, 1789, p. 421.—BONNATERRE, Ophiol., 1790, p. 1.—SHAW, Gen. Zool., III, 1802, p. 336.—DAUDIN, Hist. Rept., V, 1802, p. 328.—CUVIER, Règne Animal, II, 1817, p. 79.—MERREM, Syst. Amphib., 1820, p. 156.—BOIE, Isis, 1827, p. 562.—SCHLEGEL, Essai, II, 1837, p. 569 (exclus. homon. *C. tergeminus* Say).—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 1477.
- Crotalophorus miliarius* GRAY, Ann. Philos., 1825, p. 205.—GRAY, Griffith's Anim. King., 1830, p. 78.—HOLBROOK, N. Am. Herp., 1842, p. 25.—GRAY, Cat. Brit. Mus., 1849, p. 17.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, 1853, p. 11.—BAIRD, U. S. Pac. R. R. Expl. Rep., X, Whipple's Rept., 1859, p. 40.
- Caudisona miliaria* FITZINGER, Neue Class., 1826, p. 63.—WAGLER, Nat. Syst. Amph., 1830, p. 176.—GRAY, Zool. Misc., 1842, p. 51.—FITZINGER, Syst. Rept., 1843, p. 29.
- Figures, CATESBY, Hist. Car., II, pl. XLII.—† BONNATERRE, Ophiologie, I, fig. 1.—SCHLEGEL, Essai, XV, figs. 17, 18.—HOLBROOK, N. Am. Herp., III, pl. IV.—DUMÉRIL and BIBRON, Erp. Gén., pl. LXXXIV, bis, fig. 5; U. S. Pac. R. R. Surv. Rept., X, Reptiles, pl. XXIV.

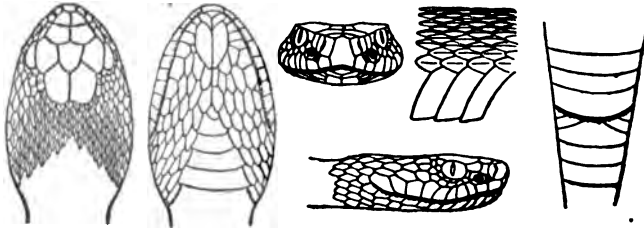


Fig. 327.

SISTRURUS MILIARIUS LINNÆUS.

= 1.

Volusia, Florida.

Collection of E. D. Cope.

This species has some marked characteristics as compared with other species of the genus. The body is robust at the middle as compared with its extremities; it tapers especially posteriorly, so that the tail is unusually slender. The rattle is proportionally reduced in size, and is smaller than that of other species of the same dimensions. Its form is acuminate and the segments are so small as to have suggested to Linnaeus the name of the species. The body is at its middle parts compressed toward the middle line, or obtusely roof-shaped. The neck is narrow and compressed, and the head oval in outline.

The canthus rostralis is sharply defined, more so on account of a shallow groove within it on the superior face of the muzzle. The rostral plate is perpendicular, and is not recurved on the muzzle. Its lat-

eral borders are concave but vertical in adaptation to the prenasal plate; below it is slightly expanded; above it slightly truncates the otherwise triangular internasals. The prefrontals have an open angle at the junction of the superciliary and frontal scuta. The frontal is but little wider than each superciliary and presents an open angle forward. Posteriorly it has a parabolic and not an angular outline, and its apex is on a line with the posterior angles of the superciliaries, with which it incloses a deep notch. Each parietal is about the size of the frontal; it is short and is broadly rounded behind.

Both nasal scuta are higher than long, the postnasal the narrowest. One loreal higher than long, entirely separating the postnasal and preoculars. One or two small scales below it and in front of the one which borders the pit. Two preoculars, the inferior sometimes divided into a short posterior and a longer anterior. Superior labials, ten or generally eleven, separated from the front of the orbit by one scale, from the rest of it by two scales. Temporals, except lowest two rows, keeled. Three pairs of geneials separated by a groove; the anterior pair largest. Gular scales smooth. Dorsal scales in twenty-one, sometimes twenty-three, longitudinal rows, all carinated, the first and second rows slightly. On the terminal fifth of the tail the urosteges are in two rows. The rattle is a miniature of that of other rattlesnakes, and has a gradual acumination of form. The gastrosteges are fewer in number than in other species, ranging as low as one hundred and twenty-three.

Ground color grayish ash of various depths, punctuated with dark brown. A series of from thirty-eight to forty-five subcircular dorsal blotches extending from head to tail, dark brown, each with a narrow distinct yellowish border. Interval rather narrower than the spots themselves. A broad band of purplish red passes from head to tail through the blotches. On each side may be distinguished three series of blotches, the first on the first and second lateral rows of scales and partly on the abdominal scutellæ. The second, alternating with this, on the second, third, fourth, and fifth rows of scales, and opposite the dorsal series. The third, alternating with the second and the dorsal series, on the fifth, sixth, seventh, and eighth rows of scales. The latter series is dusky and obsolete; the others are uniform and distinctly black.

The shape of the blotches is subjected to some variation, according to individuals. Generally subcircular or slightly oblong, they become sometimes a transversely elongated quadrangle, three times as long as wide. Their shape varies, according to the region of the body on which they are found. On the anterior third they are subquadrangular, anteriorly and posteriorly emarginated; on the middle region they elongate, and toward the posterior third become nearly circular. Backward of the anus the five or six blotches of that region extend on the sides, without, however, meeting on the lower surface. The blotches of the first lateral row are subquadrangular and a little smaller

than those of the second and third rows; the blotches of the second row being transversely oblong and largest on the middle region of the body. Side of the head purplish brown. A narrow distinct white line. A deep chestnut-brown vitta, is observed, of the same length, but broader, and lined above with a narrow, dull yellowish margin. Two undulated dark-brown vittæ extend from the vertex to the first dorsal blotch and confluent with it. A double crescentic blotch is observed on the frontal scutellæ, leaving a transversal fulvous band across the head between the orbits. The color underneath is reddish yellow, marmorated with brownish-black blotches and minute dots.

Cat. Nos.	Scales.	Upper labials.	Gastroteges.	Urostege.	Length. mm.	Tail. mm.
497	21.	11.	123.	33.	495.	65.
500	23.	10.	129.	33.		
14092	21.	11.	127.	33.		

The distribution of this species is throughout the Austroriparian region of the Nearctic fauna. The distance to which it ascends the Mississippi is as yet unknown. A color variety occurs in Sonora, according to the record of the U. S. National Museum (Cat. No. 6067), which is distinguished by the small size of its dorsal spots. They are two scales long and three wide anteriorly, and one long and seven wide posteriorly, becoming thus transverse. They are widely separated.

Sistrurus miliaris Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4283	2	Arkansas		C. Drexler	Alcoholic.
7214	1	Pensacola, Florida		do.	do.
494	1	Headwaters Colorado		Capt. John Pope, U. S. A.	do.
5460	3	Grand Coteau, Louisiana		St. Charles College	do.
504	1	Monticello, Mississippi		Miss H. Tunnison	do.
500	4	Charleston, South Carolina		E. B. Andrews	do.
497	1	Sans-bois Creek, Arkansas		Jeffers	do.
6067	4	Sonora, Mexico		Dr. Jarvis, U. S. A.	do.
8784	1	Pensacola, Florida	July 17, 1876	F. V. Stevenson	do.
8932	1	Wilmington, North Carolina		do.	do.
9703	1	Arlington, Florida	— —, 1878	G. Brown Goode	do.
9705	1	do	— —, 1878	do.	do.
10604	1	Nashville, Georgia	Oct. 3, 1880	W. J. Taylor	do.
10708	1	do	Aug. 10, 1880	do.	do.
9706	1	Arlington, Florida	— —, 1878	G. Brown Goode	do.
10736	1	Clearwater, Florida	— —, 1879	S. J. Walker	do.
10745	1	do	Aug. 26, 1879	do.	do.
10735	1	do	July 14, 1879	do.	do.
10623	1	(?)		do.	do.
9478	1	(?)	Sept. 15, 1862	Dr. Jarvis, U. S. A.	do.
15552	1	Cook County, Texas		G. H. Ragdale	do.
22337	1	Morgan Hole, De Soto County, Florida		William Palmer	do.
22338	1	Orange Hammock, De Soto County, Florida		do.	do.

SISTRURUS CATENATUS Rafinesque.

- Sistrurus catenatus* GARMAN, N. Amer. Rept., 1883, p. 176.—HAY, Batr. Rept. Indiana, 1892, p. 126.—STEJNEGER, Report U. S. Nat. Mus. for 1893 (1895), p. 411, pl. v.—BOULENGER, Cat. Snakes Brit. Mus., 2d ed., III, p. 570.
- Crotalinus catenatus* RAFINESQUE, Amer. Month. Magaz., IV, 1818, p. 41.
- Crotalus catenatus* GARMAN, N. Amer. Rept., 1883, p. 118, pl. ix, fig. 2.
- Crotalophorus catenatus* COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 685.
- Crotalus tergeminus* SAY, Long's Exped. Rocky Mts., I, 1823, p. 499.—HARLAN, Journ. Acad. Nat. Sci. Phila., 1827, p. 372.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 1480.—COPE, in Mitchell's Venom of the Rattlesnake, Smithsonian Contributions to Knowledge, No. 135.
- Crotalophorus tergeminus* GRAY, Synopsis Reptilium, 1830, p. 78.—HOLBROOK, N. Amer. Herpt., III, 1842, p. 29, pl. v.—AGASSIZ, Lake Superior, 1850, p. 381, pl. vi, figs. 6-8.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 14.—WIED, Nova Acta Acad. Leop. Car., 1865, No. 8, p. 74.
- Caudisona tergemina* WAGLER, Nat. Syst. Amphib., 1830, p. 176; Check-list N. Amer. Batr. Rept., 1875, p. 34.
- Crotalus massasaugus* KIRTLAND, Mather's 2d Report Geol. Surv. Ohio, 1838, p. 190.
- Crotalophorus kirtlandii* HOLBROOK, N. Amer. Herpt., III, p. 31, pl. vi.—GRAY, Syn. Reptilium, 1830, p. 78.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., p. 16.

Rostral plate higher than wide, with apex not recurved on summit of muzzle, subtruncate, sides concave, and base not expanded. Postnasal and preocular in contact, not separated by the single loreal. Parietal plates smaller than the superciliaries. Scales in twenty-three or twenty-five rows, all keeled, except one inferior on each side. Rattle not diminutive. Brown, with a series of darker brown transverse spots on the back, and a single series of smaller brown spots on each side, opposite to each dorsal spot. A light line extends from the postnasal plate below the orbit to the angle of the mouth, and two yellow lines extend to the mouth from the anterior and posterior edges of the maxillary fossa. Thirty-six to forty spots in the median series.

The scales of this species are generally elegantly wrinkled obliquely toward the keel and the apex. This is best marked in the subspecies *edwardsii*.

Two geographical races or subspecies of the *S. catenatus* have been described. They differ as follows:

- | | |
|---|--------------------------|
| Scales in twenty-three rows; colors paler; dorsal spots narrower; lateral spots smaller | <i>S. c. edwardsii</i> . |
| Scales in twenty-five rows; colors darker; dorsal spots wider; lateral spots larger | <i>S. c. catenatus</i> . |
| <i>S. c. tergeminus</i> . | |

SISTRURUS CATENATUS EDWARDSII Baird and Girard.

- Crotalophorus edwardsii* BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1850, p. 15.—DUMÉRIL and BIBRON, Erp. Gén., VII, p. 1483.—BAIRD, U. S. and Mex. Bound. Surv., X, p. 15.
- Caudisona edwardsii* COPE, Check-list N. Amer. Batr. Rept., p. 34.
- Figures, U. S. Pac. R. R. Expl. Rept., X, Reptiles, pl. xxiv, fig. 8 (loreal plate incorrect); U. S. and Mex. Bound. Surv., II, pl. v, fig. 1.

Canthus rostral is sharply defined; rostral plate vertical; two pre-

oculars, the superior longer than the inferior and reaching the post-nasal, which is but little smaller than prenasal. Loreal rhomboid with two scales below it.

Frontal plate subpentagonal, gradually tapering posteriorly. Twenty-three rows of dorsal scales; first and second lateral row smooth. Lateral rows of blotches proportionally very small.

The ground color is yellowish brown, with three lateral series of deep chestnut-brown blotches. Two elongated brown blotches extend from the superciliaries backward. A narrow band of chestnut brown from the posterior frontal plates passes over the eyes to the neck, under which a yellowish stripe extends from the nostril to the angle of the mouth. The snout and upper jaw are brown, with two yellow fillets diverging from the pit. The lower jaw and chin are mottled with

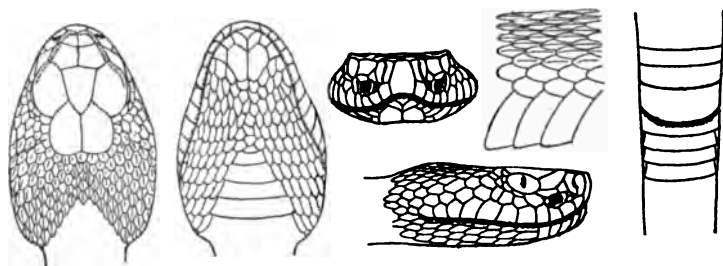


Fig. 328.

SISTRURUS CATENATUS EDWARDSII BAIRD and GIRARD.

= 1.

Wichita, Texas.

Collection of E. D. Cope.

brown and yellow. There are about forty-two dorsal brown and irregular blotches margined with deep black and encircled with a yellow fillet from the head to the tip of the tail—the thirty-fourth opposite the anus—the last three passing to the sides of the tail but do not meet below. Subcircular on the posterior half of the body, the blotches on the anterior half are longer transversely than longitudinally; emarginated anteriorly only.

The blotches of the two lateral series are proportionally small. The blotches of the upper series are more or less obsolete and alternate with the dorsal ones. Those of the second lateral series are the smallest and alternate also, being of as deep a color as the dorsal ones, but do not extend beyond the anus, occupying the second, third, and fourth rows of scales. The first and lower series affect the first and second rows, and only one scale. The belly is of a light straw color dotted and sprinkled irregularly with brown.

Cat. Nos.	Scales.	Upper labials.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.
509.....	23.	11.	141.	28.		
5177.....	23.	11-12.	136.	29.		
..... ¹	23.	11.	147.	31.	635.	91.

¹ From the collection of E. D. Cope, from the Wichita River, northern Texas.

This species ranges throughout Texas and part of Oklahoma, the Wichita specimen being the largest that I have seen. I took a specimen in the sandy region in the eastern part of Wheeler County, in the Pan Handle of Texas.

Sistrurus catenatus edwardsii Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
509	1	Mexico .....	.....	Dr. L. A. Edwards, U. S. A.	Alcoholic type.
511	1	Brownsville, Texas .....	.....	Col. J. D. Graham, U. S. A.	Alcoholic.
5177	2	Stockton, Texas .....	.....	J. Fairie	do.
506	1	Sonora, Texas .....	.....	Col. J. D. Graham, U. S. A.	do.
8409	2	Southern Arizona	— —, 1874	H. W. Henshaw	do.
22136	.....	Las Cruces, New Mexico Experiment Station.	.....	T. D. A. Cockerell	do.
17789	.....	Mount Huachuca, Arizona .....	.....	Wilcox	do.

SISTRURUS CATENATUS CATENATUS Rafinesque.

Sistrurus catenatus GARMAN, N. Amer. Rept., 1883, p. 118.

Crotalus tergeminus SAY, Long's Exped. Rocky Mts., I, p. 499—BOIE, Isis von Oken, p. 270—HARLAN, Journ. Acad. Nat. Sci., V, p. 372—BOIE, Isis von Oken, p. 563—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 1479.

Crotalophorus tergeminus GRAY, Synops. Rept., p. 78—HOLBROOK, N. Am. Herp., III, p. 29—GRAY, Cat. Brit. Mus., p. 18.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, 1853, p. 14.

Crotalophorus kirtlandii HOLBROOK, N. Am. Herp., III, 1842, p. 31—GRAY, Cat. Brit. Mus., p. 18.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 16.

Crotalophorus massasauga BAIRD, Serp. N. Y., p. 11.

Crotalophorus AGASSIZ, Lake Superior, p. 176.

Caudisoma tergeminus WAGLER, Nat. Syst. Amph., p. 176.

Figures, HOLBROOK, N. Am. Herp., III, 1842, figs. 5, 6—AGASSIZ, Lake Superior, VI, fig. 8—BAIRD, Serp. New York, pl. 1, fig. 2; U. S. Pac. R. R. Expl. Rep., X, Rept., pl. xxv, figs. 9, 11; loreal plate incorrect.

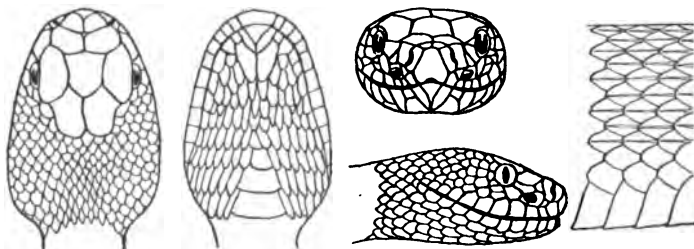


FIG. 329.

SISTRURUS CATENATUS CATENATUS RAFINESQUE.

=1.

The characters of the squamation of this subspecies have been already described under the head of the species. It is distinguished by the erect narrow rostral plate, which is truncate above, by the well-defined canthus rostralis, and especially by the trapezoidal loreal,

which permits the contact of the postnasal and the superior preocular. There are two small scales between it and the labials, and no scales between the circumfossal scale and the labials. One row below orbit in front, and two rows behind the fifth superior labial. Parietals broadly rounded, rather larger than superciliaries. The frontal is narrower than the superciliaries, and does not extend so far posteriorly. Its posterior portion contracts rather abruptly to the median angle. Four or five rows of temporal scales, which are smooth. Scales of body in twenty-five rows, of which the first is smooth and the second nearly so.

The ground color above is brown; the blotches are deep chestnut-brown blackish externally, and with a yellowish white margin. The dorsal blotches are twenty-four in number from the head to the region opposite the anus, most of which are transversely and irregularly oblong, anteriorly and posteriorly emarginated, less so, however, posteriorly; eight are subcircular. Five or six exist on the tail from the anus to its tip, extending on the sides, the last two forming sometimes a complete ring. The next series on either side is composed of small blotches, but as intensely colored as in the other series. They alternate with the dorsal ones. They have no regularity either in outline or position. The second lateral row is composed of the largest lateral blotches. They are transversely oblong or oval on the second, third, fourth, fifth, and sixth rows of scales, and opposite the blotches of the dorsal series; consequently alternating with the third series above. The first lateral series again is composed of blotches intermediate in size between those of the third and second series; they occupy the first and second rows of scales, and extend somewhat to the abdominal scutellæ, and alternating with the adjoining series. Two undulated vittæ extend from the supraorbital plates along the neck to the first dorsal blotch, and often confluent with the latter. A linear vitta margined with yellowish white extends from the posterior edge of the eye to the sides of the neck; the inferior yellow margin is the broadest, and passes from the pit close to the angle of the mouth, turning forward to the middle of the lower jaw, inclosing a semielliptical brown patch. Two elongated yellowish spots may be observed diverging from both sides of the pit to the lip. The cephalic plates are deep chestnut brown; a transverse light-brown band extends across the head from one orbit to the other.

The color underneath is blackish brown, intermingled with yellowish.

Cat. Nos.	Scales.	Upper labials.	Gastrosteges.	Urosteges.	Length.	Tail.
					mm.	mm.
522 ¹	25.	12.	143.	28.	810.	106.
545.....	25.	11.	135.	27.		
12752.....	25.	11.	137.	28.		

The rattle in this species is relatively larger than in the *S. miliaris*, and has not the acuminate form seen in that snake. The largest

¹ Rattle with seven joints.

specimen in the U. S. National Museum has nine joints and a button.

Measurements.—The entire snake measures 777 mm. in length, of which the rattle is 39 mm. (Cat. No. 12752), from Lucknow, Ontario.

As the largest species of the genus, the *Sistrurus catenatus* is the most dangerous. According to Prof. O. P. Hay,¹ this species is abundant in some parts of Indiana, but he does not confirm its occurrence south of Indianapolis. In this connection he remarks:

D. C. Ridgley reports it from Wabash County. I have seen specimens from Laporte, Hendricks, Hamilton, and Montgomery counties. They appear to be abundant in the swampy grounds in the neighborhood of Lake Maxinkuckee, in Marshall County. The black specimens are frequently found in Indiana. They were once described as a distinct species, but their dark coloration is probably nothing more than an individual variation. We have a very similar case in the differently colored forms of *Heterodon platyrhinus*, *Coluber obsoletus*, and *Natrix sipedon*.

This species is, on an average, considerably smaller than the banded rattlesnake, *Crotalus horridus*. It is, on that account, less to be feared than that serpent, since the fangs would naturally penetrate less deeply, and the amount of poison that is injected into the wound would be less. Indeed, Dr. Kirtland, of Ohio, is quoted as saying that its bite is scarcely worse than the sting of a hornet. But having had a good deal of experience with and knowledge of these snakes, I think they are not to be tampered with. Animals that have been bitten by them, such as dogs and cows, suffer much and have troublesome swellings. The rattle is less powerful than that of its larger relative, but may be heard at a sufficient distance. The snakes appear to prefer low, wet grounds as their habitation, but they are not aquatic. Yet they may often be found far away from water, in dry fields. On the prairies of Illinois, before the country became thickly populated, these reptiles were extremely abundant, and the killing of two or three dozen of them in a season was not an unusual thing for any farmer's boy. Now, in that same region not one is seen in years. This disappearance of these snakes has been supposed to be due to the destruction wrought among them by hogs. Yet on those prairies in those days there were no roaming hogs. The extinction of the snakes may be due to the breaking up of the soil, the draining of the ponds, and the clearing away of the rank vegetation, which furnishes them protection. At the present day it is only in swamps and marshes that they are found.

It appears that these snakes shed their skins at least twice a year; and since, further, Garman has shown that the segments of the rattle represent a retained portion of the sloughed epidermal covering, it seems quite probable that two or more joints of the rattle are produced each year. In any case, the age can not be determined by the number of segments, since the terminal ones are continually being worn off and lost.

The young of this species are brought into the world alive. They are about six in number at each brood, and when born are about six inches long. They appear about the 1st of September. This species has been included by Goode in his list of those whose females allow the young a place of safety in the stomach. The writer has published an account of the observations made on two females of this snake by a man of credibility, who had captured them and kept them until they had produced young.² According to these observations, the young passed freely into and out of the mother's mouth until they were a month old. After this time the mother was very attentive to the young, as I saw myself.

¹ The Batrachians and Reptiles of the State of Indiana, Indianapolis, 1893.

² American Naturalist, XXI, 1887, p. 216.

Sistrurus catenatus catenatus Rafinesque.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
435	1	Savannah, Georgia		Alcoholic.
517	1	Delaware County, Iowa	B. F. Odell	do.
514	1	Nebraska	M. Warner	do.
5362	1	New Buffalo, Michigan		do.
546	1	Columbus, Ohio	Prof. L. Lesquereux	do.
543	3	Warren, Ohio		do.
545	1	Trumbull County, Ohio	Dr. J. P. Kirtland	do.
7772	1	Indiana		do.
4656	1	Utah	Capt. J. H. Simpson, U. S. A.	do.
525	2	Racine, Wisconsin	Dr. P. R. Hoy	do.
522	1	Verdigris River	J. H. Clark	do.
17947		Paris, Illinois	O. P. Hay	do.
17950		Hamilton County, Indiana	do.	do.
15350		Central Illinois	Dr. D. W. Prentiss	do.

CROTALUS Linnæus.

Crotalus LINNÆUS, *Systema Naturæ*, 10th ed., 1758, p. 214; 12th ed., 1766, p. 572.—LACÉPÈDE, *Histoire Naturelle des Serpens*, II, 1789, p. 130 (not of Linnæus).—DAUDIN, *Histoire Naturelle des Reptiles*, V, 1802, p. 297.—CUVIER, *Règne Animal*, II, 1817, p. 77.—WAGLER, *Natürlich. Syst. der Amphibien*, 1830, p. 176.—SCHLEGEL, *Essai sur la Physionomie des Serpens*, II, 1837, p. 555.—GRAY, *Zoological Miscellany*, 1842, p. 51.—FITZINGER, *Systema Reptilium*, 1843, p. 29.—GRAY, *Cat. Brit. Mus.*, 1849, p. 19.—BAIRD and GIRARD, *Cat. N. Amer. Rept.*, Pt. 1, *Serp.*, 1853, p. 1.—DUMÉRIL and BIBRON, *Erp. Gén.*, VII, 1854, p. 1453.—COPE, *Bull. U. S. Nat. Mus.*, No. 32, 1887, p. 63.

Caudisona LAURENTI, *Spec. Syn. Rept.*, 1868, p. 92.—COPE, *Smithsonian Contributions to Knowledge, Researches on the Venom of the Rattlesnake*, by S. W. Mitchell, M. D., 1860, XII, p. 119.

Uropsophus WAGLER, *Natur. Syst. der Amph.*, 1830, p. 176.—GRAY, *Zool. Misc.*, 1842, p. 51.—FITZINGER, *Syst. Rept.*, 1843, p. 29.—GRAY, *Cat. Brit. Mus.*, 1849, p. 19.

Urocrotalon FITZINGER, *Systema Reptilium*, 1843, p. 29.

Urosteges undivided; tail terminating in a jointed rattle. Top of head covered with scales. Body cylindric.

The above simple diagnosis embraces the characters which distinguish the genus *Crotalus*. This type, the most specialized form of the order Ophidia, is chiefly distributed in North America, to which, if we regard the Mexican plateau as a part of it, twelve of the fifteen species are restricted. Two species are found in South America, but none occur in the West Indies. Within the nearctic region the distribution of species is very unequal. Thus but one species, the *C. horridus*, is confined to the eastern district. A second, the *C. adamanteus*, exists in the austroriparian district, but extends itself from this region westward across and throughout the Sonoran district as far as the Pacific Ocean, occupying also the Lower California district. This distribution is only imitated by the *Zamenis flagellum* among North American reptiles. The Central and Pacific districts are occupied by another species, *C. confluentus*, which also extends over the northern part of the Sonoran. To the Sonoran district we must go for five species: *C. molossus*, *C. tigris*, *C. cerastes*, *C. lepidus*, and *C. pyrrhus*,

which are all of rather small dimensions, except the first named. Two others are confined to the Lower California peninsula, *C. mitchellii* and *C. enyo*, while two are restricted to the Mexican plateau and its western slope, the *C. polyictus* and *C. basiliscus*.

The variations in structure of these species is not great, and they form a compact generic division. Dr. Coles has proposed to separate the *C. cerastes* as type of a separate genus, distinguished by the prolongation of the free border of the superciliary plate into a horn-like process. Were this process distinctly articulated at the base from the superciliary plate, as is the case in the viperine genus *Cerastes*, we should be compelled to adopt such a division; but at present I do not see the way to separate it, especially as the process is often but little pronounced. I have also proposed a generic division for the *C. lepidus* based on the single nasal plate, but the plate is sometimes divided in part, and for the present I do not adopt the division, or at least until I can see more specimens of the species.

The origin of the curious epidermal structure at the end of the tail, known as the rattle, is as yet a subject of speculation only. We have, however, so many rudiments of it in other generic divisions of the Crotalidæ that its origin from some of these is evident, and that it occurred at no very late period of geologic time is probable. The terminal caudal vertebrae are coossified, compressed, and expanded into a vertical body, which enters the first or basal button of the rattle. Such a modification is found in a rudimental condition in the genus *Lachesis*, where it is covered by a simple horny sheath, grooved at the sides. In *Sistrurus* the rattle is of absolutely and relatively small size, and here we can see the beginnings of the segmentation and inflation of the joints, which constitute the perfected structure. The manner of formation of these segments has not been studied as yet, but the general theory of the origin of the entire structure is probably the same in this case as in others in the animal kingdom. The violent vibrations into which most snakes throw their tails when excited has determined nutritive processes to its extremity and produced the excessive growth.

The species of this genus are of rather sluggish movements, and are not quick to bite unless trodden on. They throw the body into a coil and sound the rattle, giving a sigmoid flexure to the anterior part of the body, on which the head is poised with open mouth ready for action. At this time drops of the poisonous saliva fall from the fangs, and by a violent expulsion of air from the lungs are thrown at their enemy. In the act of biting the movement is threefold. First, there is the spring of the body, which never exceeds two-thirds of its length; second, the bite proper, caused by the seizing by the jaws; and, third, the clutch with the fangs themselves, which are moved freely backward and forward by the flexor and extensor muscles of the maxillary bone on the prefrontal as a fixed point. This grasping movement may be observed in Crotali when very much excited and anxious to bite,

and may be performed by the snake's head when severed from the body. I had a narrow escape from being bitten in this way by the head of a *Crotalus molossus*, which was attached to the body by skin only.

Rattlesnakes live in all kinds of ground, but naturally persist longest in rocky regions, where they have abundant places of concealment. Some of the species grow to a very large size, particularly the *C. adamanteus* of North and the *C. durissus* of South America. The former is probably the larger of the two; at least we have information of larger specimens. I am credibly informed that specimens have been found on the islands off the Gulf coast of Florida of 8 feet in length. Some specimens of the western subspecies *C. a. atrox* also reach a large size. The third species in dimensions is the *C. horridus*, which grows on the coast of North Carolina to a length of 5 feet and proportionate thickness. The species of the plains, *C. confluentus*, rarely reaches so large a size. Its gray-greenish color readily conceals it in the sparse vegetation and it is only observed when closely approached. It is very abundant north of the Missouri River and extends north to the Saskatchewan, beyond the line of distribution of any other species.

From the effective character of their weapons of offense and defense, rattlesnakes have a great advantage in the struggle for existence against all animals except man and his domestic companion, the pig. Hence in unsettled localities in North America they are abundant, especially in the warm regions of the South and West. In many places they are the most abundant species of snake, as, for instance, on the plains, where no species is as often seen as the *Crotalus confluentus*. That they have been much more abundant in many wild parts of the East than at present, is indicated by the great quantities of their bones which are found in the caves of the limestone regions of the Mississippi Valley. The pig, as is well known, will destroy and eat rattlesnakes with impunity. It is said that the poison is not sufficiently introduced into the circulation to cause death, owing to the thick adipose layer with which the domesticated pig is covered.

The following synopsis of the characters of the species of *Crotalus* is the result of long familiarity with them. Some of the forms originally regarded as species are treated as subspecies, owing to the evanescence of their characters. In spite of the subdivision of their head plates, the homologues of the plates of harmless snakes may be traced. Thus, there are from two to three preoculars and from one to four loreals. The nasals are never more than two, and the nostril is always between them. There is one pair of genaeals. The species of Section I display homologues of internasal and prefrontal plates, while the same, more divided, are seen species of Section II.

The transitional forms or subspecies in this genus, as is usually the case, furnish instructive evidence as to the evolution of the character of the species. It is not improbable, as already remarked, that their

origin is from some genus like *Lachesis*, which had a scaly head and no rattle.

I. Top of muzzle with three pairs of symmetrical shields in contact. (Scales in 29 rows.)

Longitudinal bands on neck; four rows of scales below orbit; yellow with black rhombs embracing yellow centers *C. durissus* Linnaeus

Longitudinal bands on neck; four rows of scales below orbit; brown above with darker light-edged rhombs *C. terrificus* Laurenti

No longitudinal bands on neck; yellow brown, with large adjacent chestnut-red yellow-bordered dorsal rhombs, alternating with lateral chestnut spots; labials, 14; two and three scales below eye.

C. basiliscus Cope.

No longitudinal bands on neck; tail black; brownish yellow above, with small transverse reddish dorsal rhombs, the angles produced as lateral bands; five scales below eye.

C. molossus Baird and Girard

II. Top of muzzle with numerous scales or small plates. Superciliary not produced.

A. Nasal plate not separated from rostral.

α. One or two loreals.

β. Rostral plate higher than wide.

γ. Tail light with black cross-bands.

Scales of canthus rostralis larger than those on top of muzzle; dorsal spots large, pale-edged rhombs on a paler ground; no neck stripes; scales in 25-29 rows *C. adamantus* Beauvois

γγ. Tail with brown or indistinct bands. Muzzle with the marginal scales larger than the median; scales in 23-27; three rows of brown dorsal spots, the median large; postocular band passing above canthus oris. *C. confluentus* Say.

Eight smooth longitudinal plates on top of muzzle; two loreals; scales in 27 rows; a postorbital spot; five rows of dorsal spots.

C. polystictus Cope.

Six smooth square plates on top of muzzle; one loreal; scales in 23 rows; three rows of dorsal spots, the median large.

C. triericius Wagler

Small; internasal and prefrontal plates large; nine supralabials; a dark-brown band from eye to angle of mouth; two rows of small brown dorsal spots *C. pricei* Van Denburgh

γγγ. Tail uniformly black. Scales of canthus rostralis larger than those of top of muzzle; postocular band passing above mouth angle; angular spots above uniting into double chevroned cross-bands; scales in 25 rows. *C. horridus* Linnaeus

ββ. Rostral plate as wide as or wider than high.

No canthus rostralis; posterior canthal plate smaller than internasals and decurved, replacing a superior loreal; one loreal; dorsal spots indistinct in adult; postocular band striking mouth; tail white, with black rings *C. ruber* Cope.

A canthus rostralis; posterior canthal plate larger than internasals, not decurved; two loreals; head scales keeled; six rows of body scales smooth on each side; supraorbitals entire; small, well-separated dorsal rhombs on light ground with lateral spots adjacent; postocular band passing above mouth.

C. enyo Cope.

Supraorbitals generally incised or divided by suture; head scales smooth; all body scales keeled; buff, with small, separate, light-brown dorsal rhombs, which become crossbars posteriorly; no head bands. *C. tigris* Kennicott

αα. Three or more loreal scales.

Rostral plate as wide as high; several smooth plates on top of muzzle; scales in 23 rows; greenish, with black rings (sometimes), interrupted; no postocular band. *C. lepidus* Kennicott.

AA. Nasal plate separated from rostral by small scales.

Rostral plate as wide as high; loreals 2-5; scales of muzzle or of canthus not enlarged; tail black-ringed, punctulate with black, forming indistinct dorsal spots, which become bands posteriorly.

C. mitchellii Cope.

III. Top of muzzle with numerous scales; superciliaries produced into a horn like process.

Rostral wide as high; muzzle scales smooth above; loreals two; scales in 21 rows; pale, with small dorsal spots and cross bands on tail.

C. cerastes Hallowell.

The descriptions of the following supposed species do not coincide with those of any species known to modern naturalists:

Crotalus dryinus LINNÆUS, Syst. Nat., I, 1766, p. 372; quoted by Gmelin, Lacépède, Bonnaterre, Daudin, and Merrem.

Crotalus horridus BODDAERT, Nova Acta, VII, 1783, p. 16; quoted by Gmelin and Le Conte.

The following names refer to species which I can not identify with or distinguish from known species either on account of want of specimens, imperfect descriptions, or references which can not be unraveled.

Crotalus adamantus JAN, Rev. et Mag. Zool., 1859, p. 153.

Crotalus atricaudatus MERREM, Syst. Amphib., 1820, p. 157.

Crotalus omanensis HUMBOLDT, Humboldt and Bonpland, Recueil L'Observ., 1833, p. 6.

Crotalus durissus BODDAERT, Nova Acta, VII, 1783, p. 16.—MERREM, Syst. Amphib., p. 157, var. *a* GMELIN, Syst. Nat., I, 1788, p. 1081.

Crotalus exalbidus BODDAERT, Nova Acta, VII, 1783, p. 16.

Crotalus horridus JAN, Rev. et Mag. Zool., 1859, p. 153.

Crotalus rhombifer MERREM, Syst. Amphib., p. 157.

Caudisona orientalis LAURENTI, Synops., 1768, p. 94.

Crotalus strepitans DAUDIN, V, 1802, p. 318; "Said to be *Boa canina*."—GRAY, Synops. Rept., p. 78.

Caudisona gronovii LAURENTI, Synops., p. 94; perhaps *Lachesis mutus* Daudin.

Oropsophus triseriatus WAGLER, Nat. Syst. Amph., 1830, p. 176.—GRAY, Cat. Snakes Brit. Mus., p. 116; perhaps *Caudisona lucifer*.—JAN, Icon. Gén. Ophid., p. 29, places this specimen in *Crotalus* (*Sistrurus*).

The following supposed species, according to Boie,¹ is *Tropidonotus quincunciatus* with a crepitaculum of a rattlesnake attached:

Crotalus tessellatus HERMANN, Observat. Zool., 1804, p. 271.

The following species are not rattlesnakes:

Crotalus mutus LINNÆUS, Syst. Naturæ, 12th ed., 1766, p. 373, and GMELIN Linnæus' Syst. Nat., 13th ed., 1788, p. 1882, is *Lachesis mutus* DAUDIN.

Crotalus piscivorus LACÉPÈDE, Serp., II, 1789, pp. 130, 424 (= *C. aquaticus* SHAW, Gen. Zool., III, 1802, p. 425), is *Ancistrodon piscivorus*.

¹ Isis von Oken, 1827, p. 562.

CROTALUS MOLOSSUS Baird and Girard.

- Crotalus molossus* BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 10.—BAIRD, U. S. and Mex. Bound. Surv., Reptiles, 1859, p. 14.—COPE, Checklist N. Amer. Batr. Rept., 1875, p. 33.—COPE and YARROW, U. S. Geog. Surv. W. of 100th Mer., V, 1875, p. 533.—COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 12.—STEJNEGER, Rep U. S. Nat. Mus. for 1893, 1895, p. 424.
- Crotalus ornatus* HALLOWELL, Proc. Acad. Nat. Sci. Phila., VII, 1854, p. 192; U. S. Pac. R. R. Expl. Rept., X, Parke's Rept., 1859, Reptiles, p. 23.
- Figures, U. S. Pac. R. R. Expl. Rept., Reptiles, XXIV, fig. 5; Parke's Rept., pl. II; U. S. and Mex. Bound. Surv., pl. III.

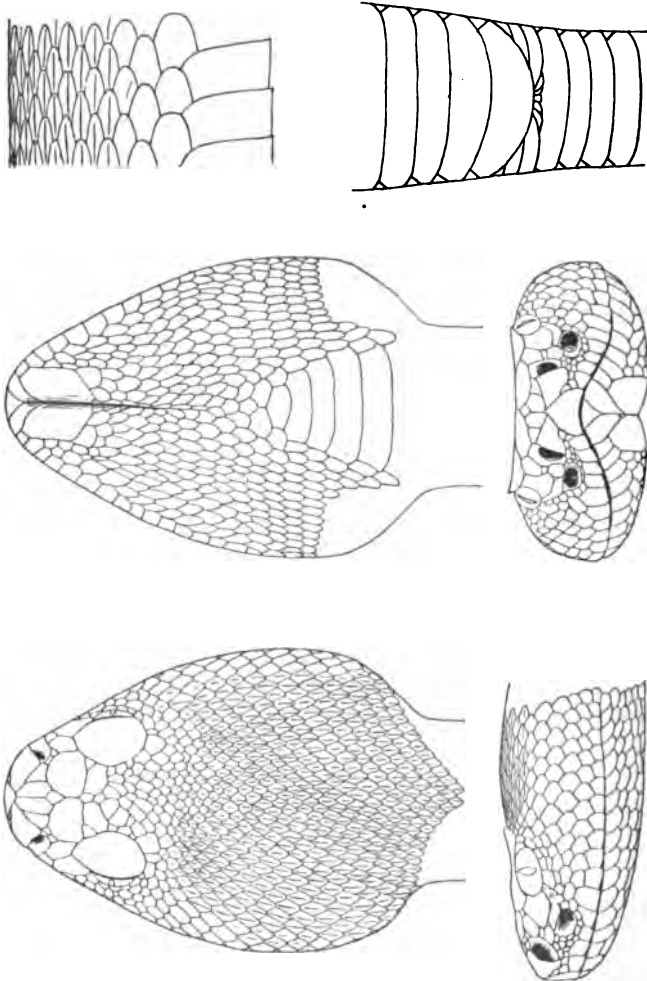


FIG. 390.
CROTALUS MOLOSSUS BAIRD AND GIRARD.

= 1.

Muzzle broad; rostral small. Scales between superciliaries small, uniform, except the two anterior. Two frontal plates, four postfrontals. Two intersuperciliary, all in contact. Five rows of scales between the labials and suborbital row. Middle row not extending beyond the

middle of the orbit. Labials eighteen above, fifth and sixth largest; seventeen below. Dorsal rows of scales twenty-nine. Two external rows small. Tail uniform black. Color roll sulphur, a series of chestnut-brown transverse lozenges, with exterior corners produced to the abdomen. Centers of lozenges with one or two spots. Each scale but one color. A brown patch below and behind the eye.

Head very broad in front; outline nearly rectangular. Rostral small. Two internasal frontals; behind these four plates, the exterior resting on the superciliary; behind these two other plates, between and in contact with the superciliaries. Anterior nasal subtriangular. Top of head with numerous smooth subtuberculous scales. Suborbitals large, extending to the anterior canthus. General aspect smoother than in *Crotali* generally, scales rounded at the posterior apex, carinated but slightly.

General color above that of roll sulphur, beneath pale yellowish, posteriorly very faintly clouded with brownish. Tail black. Anteriorly the scutellæ are entirely immaculate. Along the back is a series of transverse reddish or chestnut-brown lozenges embraced in a width of twelve or fourteen scales and four or five scales long, and with the exterior angles produced to the abdomen. These lozenges are frames with the outline generally one scale in width and with the centers of the ground color; sometimes divided by a median line of brown, so as to show two yellowish spots inside of the lozenges. The scales exterior to the lozenges are rather lighter. Sometimes the brown rings and the lozenges widen at the abdomen and indicate lateral spots of four scales; at others, and especially anteriorly, the rings are obsolete, and the brown is in a dorsal series. In fact, for the anterior fourth of the body we have a dorsal patch of brown, showing alternately at successive intervals one large yellowish spot and then a pair of smaller ones, owing to the confluence of the successive lozenges. The superciliaries and scales anterior to them, as well as a broad patch below and behind the eye, light greenish brown. Tail uniform dark brown above, paler beneath. Only one button with two necks, no rattle.

A remarkable character of this species is that each individual scale is of a uniform tint to its base, and does not show two colors, as in other species.

Cat. No. 485; rows of scales, 29; gastrosteges, 203; urosteges, 24; total length, 1,097 mm.; tail, 79 mm.

This large species is the only one within our political limits which possesses the characters of the head scales found in the Neotropical species. Among these it approaches nearest the *C. basiliscus* Cope.¹ That species has, however, well-defined dorsal rhombs, as in *C. terrificus*, *C. adamanteus*, etc. Its habitat is southern New Mexico and Arizona and northern Sonora and probably Chihuahua. It is the largest and

¹ Proc. Acad. Nat. Sci. Phila., 1864, p. 166.

most dangerous species of that region, where it is known as the "black tail."

Near Lake Valley, southern New Mexico, I killed a fine specimen of this species, which I discovered in the act of springing through a bush. When I struck it, it was suspended over a branch, looking at me. It was heavy in its movements, except at the moment of leaping.

Crotalus molossus Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8398	1	Southern Arizona.....	Oct. —, 1873	H. W. Henshaw.....	Alcoholic.
485	1	Sonora, Mexico.....		Col. J. D. Graham, U. S. A.	do.
486	1	Pecos River, Texas.....		Dr. A. L. Heerman.....	do.
17788	1	Fort Huachuca, Arizona..		Dr. T. Wilcox.....	do.
21107	1	do.....		do.....	do.
19474	1	Mexican boundary line...		Dr. E. A. Mearns.....	Skin.
21724	1	Tucson Mountains, Yuma County, Arizona.		do.....	Alcoholic.

CROTALUS BASILISCUS Cope.

Crotalus basiliscus COPE, Proc. Amer. Phil. Soc., XXII, 1885, p. 180.—DUGÈS, *Naturelle* (2), I, 1888, p. 133.—COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 688.

Caudisona basilisca COPE, Proc. Acad. Nat. Sci. Phila., 1864, p. 166; 1866, p. 308.

Crotalus rhombifer DUGÈS, *Naturelle*, IV, 1877, p. 22. (Not of Latreille).

Crotalus terrificus BOULENGER, part, Cat. Snakes Brit. Mus., III, 1896, p. 574.

Two pairs of symmetrical muzzle plates in contact; third, or posterior, pair subdivided. Rostral subtriangular, higher than wide, in immediate contact with nasals and frontals. Oblique length of postnasal equal horizontal length of prenasal; latter separated by small scales from the anterior labials. Fourteen superior labials, separated from the suborbital series by two and three rows of scales. Three flat plates between the elongate, flat superciliaries. Temporals smooth. Scales in twenty-nine rows, external largest, and with two next on each side smooth. Tail stout, surrounded by thirteen longitudinal rows at the middle. Rattle very acuminate, with a lateral groove. Gastrosteges, one hundred and ninety-nine; urosteges, twenty single, four terminal divided. End of muzzle to rictus, 35 mm.; to vent, 1,116 mm.; vent to base of rattle, 77 mm.

Ground color pale-yellowish brown, much replaced by the following markings, which are on entire scales, not parts: about thirty dorsal rhombs from a short distance posterior to head to opposite vent, of a bright chestnut red, browner medially and white bordered, five scales long and fourteen wide inside the white border, on the median part of the body, where they are in contact. Posteriorly they are separated, anteriorly elongate. Laterally, between each two rhombs a spot of bright chestnut. Belly and inferior scales yellow, every second or third lateral one the base of a short oblique chestnut band. Head dark brown; two elongate occipital spots. Superior labials yellowish. A narrow

yellowish line from the small eye to the rictus. No lines on the neck. Tail dark gray, with five obscure rings.

This is the largest species of the Tierra Templada of Mexico, and it ranges over the whole of it. Dr. Dugès has found it near Guanajuato, and it occurs in the Valley of Mexico. I described it from a specimen from Colima, and the Geographical Commission of Mexico found it afterwards in the State of Puebla. It has not yet been found within the limits of the United States. Boulenger does not distinguish it from the *C. durissus* of South America, which occurs in the Tierra Caliente of Mexico.

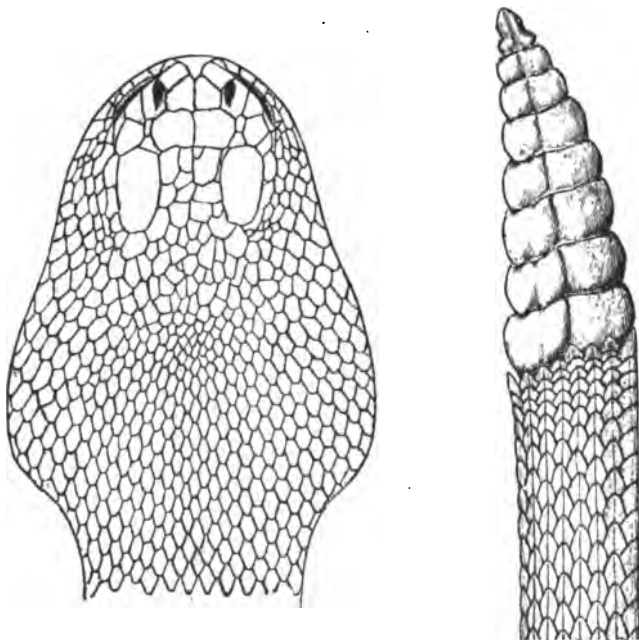


Fig. 331.

CROTALUS BASILISCUS COPE.

= 1.

Colima, Mexico.

CROTALUS ADAMANTEUS Beauvois.

Crotalus adamanteus BEAUVOIS, Trans. Amer. Phil. Soc., IV, 1799, p. 368.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 33.—STEJNEGER, Rept. U. S. Nat. Mus. for 1893, 1895, p. 433.

Muzzle with small scales between those of the canthus rostralis; rostral plate in contact with the nasals; one or two loreals. Scales in from twenty-five to twenty-nine rows. Color brown or gray, with large rhombic spots on the back, which extend to the head without being replaced by longitudinal stripes anteriorly. Tail light colored, with black cross-bands. Gastrosteges, from one hundred and sixty-eight to one hundred and eighty-six. Size large. A broad dark-yellow bordered postocular

band generally present, which descends to the edge of the mouth anterior to its angle, or canthus.

This species presents greater variations than any other known, and its subspecies have been regarded as species. I find transition from one to the other of these forms, however, and they forbid recognition of more than one species. This form ranges from the Atlantic to the Pacific in the warmer parts of North America, and descends to Chihuahua and Cape St. Lucas to the southward in Mexico. This is the largest and most formidable species of the genus, examples eight feet in length having been reported to me from the Gulf coast of Florida by Admiral McCauley, U. S. N.

The subspecies differ as follows:

- Entire top of head covered with irregular flat scuta larger than the usual scales; body colors paler than tail bands; dorsal rhombs with truncated angles one; loreal plate *C. a. scutulatus*
 Top of head with large plates on canthus rostralis, but scales elsewhere; two loreal plates; dorsal rhombs complete, not paler than caudal bands; last caudal band a broad ring *C. a. adamanteus*.
 Top of head with plates on canthus and scales between; generally one loreal plate; dorsal rhombs paler than bands of tail, which is not black at end *C. a. atrox*.

CROTALUS ADAMANTEUS SCUTULATUS Kennicott.

Crotalus adamanteus scutulatus COPE, Check-list N. Amer. Batr. Rept., 1875, p. 33; Proc. Amer. Phil. Soc., XXIII, 1886, p. 287; Report U. S. Geog. Survey W. of 100th Mer., V, 1875, p. 607.

Caudisona scutulata KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1861, p. 207.—COPE, Proc. Acad. Nat. Sci. Phila., 1866, pp. 307-309.

Crotalus scutulatus BOULENGER, Cat. Snakes Brit. Mus., 2d. ed., III, 1896, p. 575.

Crotalus salvini GÜNTHER, Biol. C. Amer., Rept., 1895, p. 193, pl. LIX, fig. A (according to Boulenger).

Rostral triangular, nearly as wide as high. Two rather small inter-nasal plates in contact; four prefrontals, the external the larger. Space between superciliaries narrow, filled with large flat plates. Scales on the occiput large and frequently representing parts of parietal plates. One loreal. Dorsal rows of scales twenty-five, the external nearly smooth. Labials sixteen above, sixteen below. Three rows of scales between the suborbitals and labials. Light stripe from angle of eye to canthus rostralis above the labials, and another from before the eye to the labials, as in *C. a. atrox*, but the rostral and space in front of the pit and nostril not lighter than the crown. On the middle third of the body a dorsal series of distinct rhomboids, margined with whitish and with the lateral angles acute, much as in *C. a. atrox* or *C. a. adamanteus*; the longitudinal angles sometimes perfect, at others truncate or emarginate. Nineteen brown half rings, posteriorly narrow and separated by wider light intervals than in *C. a. lucifer*. Rings on the tail narrow, irregular, and quite black.

This subspecies so closely resembles *C. atrox* that a description of it must be comparative to some extent. The head is longer and nar-

rower posteriorly than in *C. lucifer*, and the nose is much more depressed, the rostral being triangular and as wide as high, while in *C. lucifer* it is a third higher than wide. There are two small subtriangular or sub-circular internasals in contact, and behind these is a row of four scales, the outer and largest one lying directly over the nostril; posterior to these is a third row of five or six scales connecting the anterior extremities of the superciliaries, the external scale of which row is a little in advance of the rest; behind this row two very large scales connect the superciliaries, behind which the crown is covered with plates much larger than in *C. lucifer*. The space between the superciliaries is narrower than in *C. lucifer*, and is occupied in front by but two longitudinal rows of scales, while there are six to eight in the former species. The rattle is more slender than in any other species excepting *C. cerastes*.

The markings on the body of this species are much as in *C. atrox* and

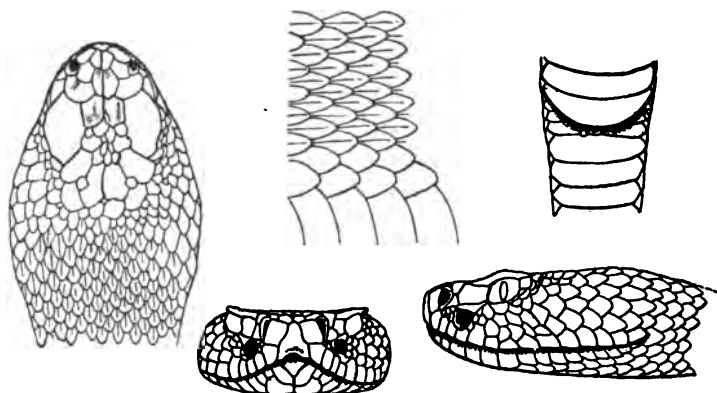


Fig. 332.

CROTALUS ADAMANTEUS SCUTULATUS KENNICOTT.

= 1.

Fort Buchanan, (Tucson) Arizona.

Cat. No. 5091, U.S.N.M.

quite unlike those of *C. lucifer*. The ground color is light yellowish or brownish ash; on the middle third of the body there is a dorsal series of rhomboidal blotches more or less truncated before and behind; anteriorly they become elongated longitudinally, and not only truncated, but sometimes emarginate on the longitudinal angles, while the lateral angles are rounded, leaving the blotches subcircular. Posteriorly the dorsal blotches continue to have the lateral angles acute and perfect till they become confluent with a lateral series, and form nineteen half rings, six of which are on the tail. In the middle third of the body the dorsal blotches are included in eleven or twelve dorsal rows and are four to four and a half scales in longitudinal extent; anteriorly they become longer longitudinally, and only nine to ten scales in transverse diameter. The dorsal blotches are light brown, bordered for the width of one scale with darker. They are separated along the backs by a line of the ground color one and a half to two scales in width, and imme-

diately bordered by a narrow line lighter than the ground color, as in *C. confluentus*, *C. a. atrox*, and *C. a. adamanteus*, this line being about a half scale in width. Posteriorly the light intervals between the rings widen to three or three and a half scales, while the rings themselves become much narrower, being only two to three scales wide. On the middle third of the body below, and opposite to the dorsal series, is another row of small rhomboidal or sometimes triangular brown blotches on each side. They involve four to six scales and extend from the second to the fifth lateral row of scales, and are bordered by light lines like the dorsal series, from which they are separated by a single scale. Indications are seen of another series of small blotches resting directly upon the abdominal scutellæ, alternating with and a little lower than the first lateral series. The abdomen is whitish yellow without distinct blotches. A light line from posterior angle of superciliary and orbit to angle of jaw above labials, and another from before the eye to labials. The markings of the head of this species seem to be very nearly the same as in *C. lucifer*. There is, however, indications of a light border to the external edge of the superciliary, and the rostral and entire space in front of the nostril and pit, as well as a little posterior to these, is as dark as the crown, while in *C. lucifer* they are distinctly lighter.

Though this subspecies so closely resembles *C. adamanteus atrox*, it will be readily distinguished by the large plates of the head and by the dorsal rhombs being more imperfect in their outlines anteriorly and posteriorly. The type specimen (Cat. No. 5021), and another (Cat. No. 8669), might be properly referred to Section I of the genus with the *C. molossus*, since the anterior head scuta are quite identical with those of that group, but Cat. Nos. 14225 and 14278 show division of these plates. The tendency to form parietal scuta is peculiar to this subspecies. Like the *C. molossus*, its habitat is on either side of the United States and Mexican boundary, where it is not uncommon. I have not seen specimens from south of the city of Chihuahua. Dr. Boulenger¹ records it from Huamautla.

Cat. Nos.	Scales.	Upper labials.	Gastronotegæ.	Urostegæ.	Length, mm.	Tail, mm.	Rattle, mm.
5021.....	25.	14.	176.	23.			
14225.....	25.	15.	171.	20.			
14278.....	25.	15.	171.	22.	986.	114.	48.

Crotalus adamanteus scutulatus Kennicott.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
5021	1	Fort Buchanan, Arizona.....	Dr. B. J. D. Irwin, U. S. A.....	Alcoholic.
8669	2	Mohave Desert, Arizona.....	Dr. O. Loew.....	do.
285	1	Gila River Bottom.....	A. Schott.....	do.
14225	1	Chihuahua City.....	E. Wilkinson.....	do.
14278	1	do.....	do.....	do.
14759		Camp Grant, Arizona.....	E. Palmer.....	do.
19670-1		Fort Huachuca, Arizona.....	Dr. T. E. Wilcox.....	do.
21109		do.....	do.....	do.

¹ Catalogue of the Snakes of the British Museum, III, p. 575.

CROTALUS ADAMANTEUS ADAMANTEUS Beauvois.

- Crotalus adamanteus adamanteus* COPE, Check-list N. Amer. Batr. Rept., 1875, p. 33.
Crotalus adamanteus BEAUVOIS, Trans. Am. Phil. Soc., IV, 1799, p. 368.—HOLBROOK, N. Am. Herp., III, 1842, p. 17.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 3.—LE CONTE, South. Med. and Surg. Journ., IX, 1853, p. 664.—STEJNEGER, Rept. U. S. Nat. Mus. for 1893, 1895, p. 433, pl. x.
Crotalus rhombifer LATREILLE, Hist. Rept., III, 1801, p. 197.—DAUDIN, Hist. Rept., V, 1802, p. 525.—DUMÉRIL and BIBRON, Erp. Gén., VII, 1852, p. 1471.
Crotalus durissus SHAW, Gen. Zool., 1802, p. 333.
Crotalus terrificus LE CONTE, Proc. Acad. Nat. Sci. Phila., VI, 1853, p. 419 (exclus. homon. *Caudisoma terrificus* Laurenti, p. 418).—COPE, Proc. Acad. Nat. Sci. Phila., 1859, p. 337 (exclus. homon. *C. terrificus* Laurenti).
Crotalus oregonus HOLBROOK, N. Am. Herp., III, 1842, p. 21.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 145.
Figures, † SHAW, Gen. Zool., III, pl. LXXXIX.—DAUDIN, Hist. Rept., V, pl. LX, figs. 22, 23.—HOLBROOK, N. Am. Herp., III, pl. II; U. S. Pacific R. R. Report, Reptiles, pl. XXIV.

Head wide posteriorly; muzzle obtuse, not especially elevated. Nasal plates distinct from each other and separated from the two elongate preoculars by two loreals, of which the superior is the smaller, being sometimes quite small. Two rather small internasal plates which are connected with the superciliaries by two large plates of the canthus rostralis, the posterior one of these being quite large. Seven or eight rows of smooth scales between inner edges of superciliaries. Three rows of scales between orbits and superior labials. The latter number fifteen, the inferior eighteen. The scales of the cheek are smooth. Scales in twenty-seven or twenty-nine rows, the two inferior rows smooth, the third and fourth obsoletely, the rest strongly keeled.

Scales on the back and sides not conspicuously different in size except the lower two or three rows. Posteriorly, near the tail, all the scales are carinated; except the lowest.

General color, yellowish gray, with rhomboidal black blotches, lighter in the center, and with all the angles perfect. Or rather there is a series of dull yellowish lines crossing obliquely from one side of the abdomen to the other over the back, following the oblique series of scales, and occupying generally the posterior half of each scale, the basal portion being black. These lines, of which there are about thirty-six crossing from each side, from head to tail (nine on tail), decussate first on the fifth or sixth lateral row, and then on the back, where they are more or less confluent three or four rows. The rhomboids thus enclosed and crossing the back are generally black for one and one half or two scales within the yellowish lines, and the most central portion is dark yellowish brown, mottled with darker. The intervals on the sides between the lines are mostly dark yellowish brown, minutely mottled with dark brown. These intervals constitute a lateral series of transverse rhomboids, sometimes with the lower angle truncated. Opposite to the dorsal rhomboids is a series of small triangles in the angles of the first decussation. The distance between

two parallel transverse stripes generally consists of five rows of scales, occasionally of six.

On the sides and posteriorly these markings are more or less indistinct, though generally recognizable. The tail usually exhibits a good deal of black. The under parts are dull yellowish white, or greenish

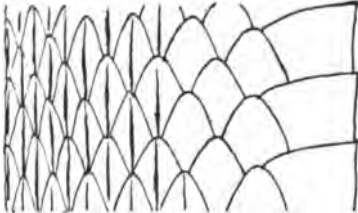
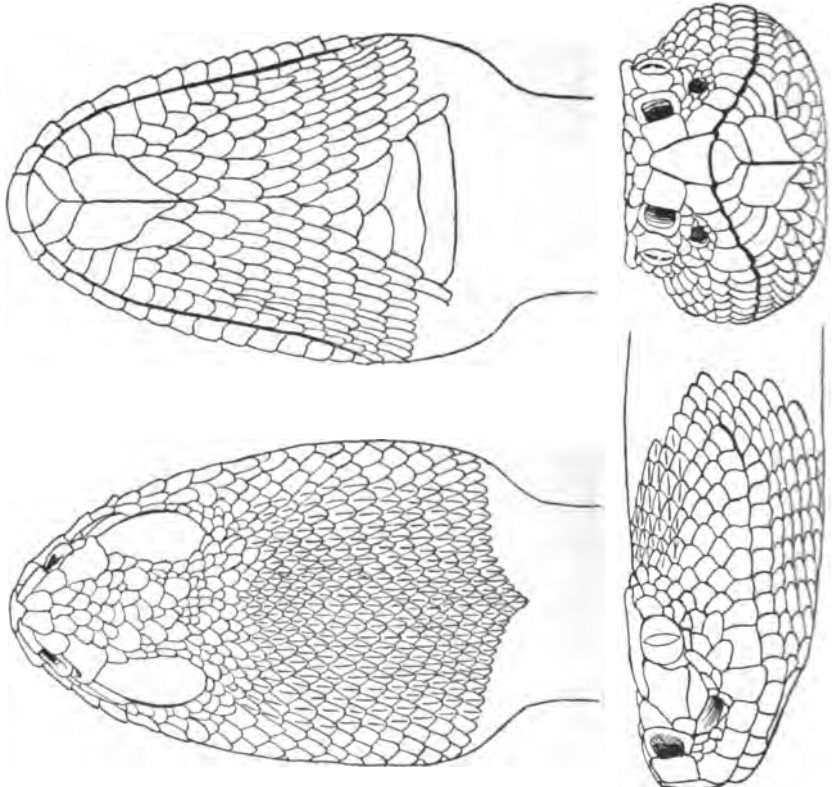


Fig. 383.
CROTALUS ADAMANTEUS AD-
MANTEUS BEAUVOIS.
 = 1.
 Gainesville, Florida.
 Cat. No. 14792, U.S.N.M.



white, clouded toward the sides with brown. No regular spots visible. The black on the tail does not constitute complete rings, but is interrupted in the middle of the lower surface, and in fact the black patches alternate with each other, and are not opposite. The last patch, however, forms a complete ring wider than the rest, so that the end of the tail is black. This is peculiar to the subspecies *C. a. adamanteus*.

The top of the head is light brown, with occasional black scales. A dull yellowish streak starts at the posterior edge of the superciliary plate, and passing obliquely backward, through two rows of scales, extends to the angle of the mouth. A second band starts on the plate in advance of the superciliary, and crossing the anterior orbitals, expands till it involves the seventh, eighth, and ninth upper labials. Interval between the first two stripes dark brown. There are also indications of a second vertical light bar in front of the nostril, and two below the pit. Rostral dark yellowish, lighter in the margin.

Cat. Nos.	Scales.	Upper labials.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.	Rattle. mm.
250	28.	15.	168.	31.	1208.	145.	44.
252	27.	14-5.	176.	16.			
4393	28.	15.	178.	26.			
14139	29.	15.	179.	22.			

The largest specimen now in the U. S. National Museum is 6 feet in length, or 2.025 mm.; the tail measures 235 mm., of which the rattle is 70 mm. The latter, though broken, has twelve joints and a button. The rhombs on the posterior part of the body are very obscure, and the tail bands are not so black as in younger specimens. Professor Holbrook mentions specimens of 8 feet in length and Admiral E. Y. McCauley, U. S. N., assures me that he has seen specimens of that size on the island off Pensacola, Florida. This is, then, the most bulky of the venomous snakes. The Najid *Ophiophagus bungarus* exceeds it in length, but is a slender snake.

Crotalus adamanteus adamanteus Beauvois.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
250	1	Charleston, South Carolina	.....	Dr. S. B. Barker	Alcoholic.
270	1	Saint Augustine, Florida.	.....	J. C. H. Snell	do.
252	1	Jackson, North Carolina.	.....	Fitzgerald	do.
4293	1	Arkansas.	.....	.....	do.
10550	3	Gainesville, Florida	Apr. 18, 1881	James Bell	do.
4393	1	Arkansas.	.....	Colonel Kearney	do.
.....	1	Charleston, South Carolina	.....	Dr. G. E. Manigault	Skeleton.
9501	1	Sanford, Florida	.....	.....	Skin.
9625	2	Sanford, Florida	— —, 1879	D. S. Way	Casts.
9298	1	Brookhaven, Mississippi.	.....	T. J. Keenan	Alcoholic.
14139	1	Pilot Town, Florida.	.....	C. C. Nutting	do.
10067	1	Gulf Hammock, Florida.	Apr. —, 1879	W. J. Cameron	do.
10821	1	Gainesville, Florida	Mar. —, 1881	James Bell	do.
10820	1	do	do	do	do.
10818	1	do	.....	.....	do.
10542	1	do	.....	.....	do.
10825	1	do	.....	.....	do.
10826	1	do	.....	.....	do.
12082	1	(?)	.....	.....	do.
14792	.....	Gainesville, Florida.	.....	James Bell	do.
14819	.....	Fort Wingate, New Mexico	.....	Dr. R. W. Shufeldt	do.
14825	.....	Gainesville, Florida.	.....	James Bell	do.
14841	.....	do	.....	do	do.

Dr. Einar Lönnberg¹ writes of this species as follows:

In the interior of Florida the diamond-backed rattlesnake is scarce, but not so along the coast and on some of the Florida keys. In the neighborhood of Ozone, in Hillsboro County, I heard of the killing of nine rattlesnakes within two weeks in October, 1893. It evidently prefers the neighborhood of the water, and is a good swimmer, not afraid to cross over from "key" to "key." If not too often disturbed this species is slow and does not rattle unless offended. I saw one in the latter part of October in the pine woods near Toronto, Orange County, coiled up under a palmetto bush. A dog following us went up and sniffed at him, with his nose hardly a foot from the snake. We called the dog back, and a man ran forward with a whip and struck the snake several times. After the second blow the snake began to rattle and make himself ready to strike. This shows plainly the slow nature of the snake. In other cases they are more easily offended. Those kept in boxes and cages often begin to rattle as soon as they see anyone approaching. They are easy to keep alive, and take food without trouble. I saw one that was kept in a small box and was fed with toads; it did so well there that it changed its skin twice in a summer. They are often kept in the shops of taxidermists and in "curiosity stores," where northern tourists buy them, paying good prices. The skin is often used for ornaments or for the manufacture of pocketbooks and similar objects.

People are very seldom bitten by rattlesnakes in Florida. The rattling, the strong odor, and the slowness of the snake are protective. The snake is often caught by placing an empty barrel over the coils, after which a board is shoved under the snake and the whole thing turned over.

CROTALUS ADAMANTEUS ATROX Baird and Girard.

Crotalus adamanteus atrox COPE, Check-list N. Amer. Batr. Rept., p. 33; Rept. U. S. Geog. Survey, W. 100th Mer., V, 1875, p. 607.

Crotalus atrox BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1855, p. 5.—BAIRD, U. S. and Mex. Bound. Surv., Reptiles, 1859, p. 14; U. S. Pacific R. R. Rept., X, Whipple's Rept., 1859, p. 39.—STEJNEGER, Rept. U. S. Nat. Mus. for 1893, 1895, p. 406, pl. XI.

Figures, U. S. Pac. R. R. Rept. Reptiles, pl. XXIV, fig. 3; U. S. Mex. Bound. Surv., Reptiles, pl. I.

Plates on head; two internasals in contact; between these and superciliaries, on side of the crown, two imbricated plates. Space inclosed occupied by smaller scales. Superciliaries bordered by a row of larger scales; the anterior much largest. Three rows of scales between labials and suborbitals. Labials sixteen above; first, fifth, and seventh largest; fifteen below, first and third largest; one loreal plate, which represents the inferior loreal of the *C. a. adamanteus*, except in specimens from lower California, where the superior loreal is present. Scales in 25—27 rows, the exterior smooth.

General style of coloration somewhat as in *C. adamanteus*. Ground-color above dull yellowish brown, with a series of subhexagonal patches from the head nearly to the tail, in an uninterrupted series, separated throughout by narrow lines. We may refer the markings to the intersection of light yellowish lines, about forty in number, crossing obliquely from each side across to the other, along the anterior half of as many oblique series of scales. The lateral decussation is along the sixth row

¹ Notes on Reptiles and Batrachians collected in Florida in 1892 and 1893. Proc. U. S. Nat. Mus., XVII, 1894, p. 335.

of dorsal scales; on the back, where they cross, the lines are confluent for a breadth of five or six scales, making a series of transverse lines across the back, truncating the obtuse angles of the rhomboids, which would otherwise be produced. Sometimes the acute lateral angle of the rhomboids are also truncated. Laterally, the yellowish lines are more or less obsolete, leaving a more or less distinct chain pattern. The rhomboids or subrhomboids inclosed have a narrow margin of dark brown, lighter toward the center. In all cases the interval between the successive rhomboids is but one or two half scales in width. The lateral rhomboids and triangles referred to in *C. a. adamanteus* are indicated by two alternating series of dark brown blotches, the first along the third and fourth lateral row, opposite the apices of the rhomboids; the second along the sixth and seventh, and alternating with the

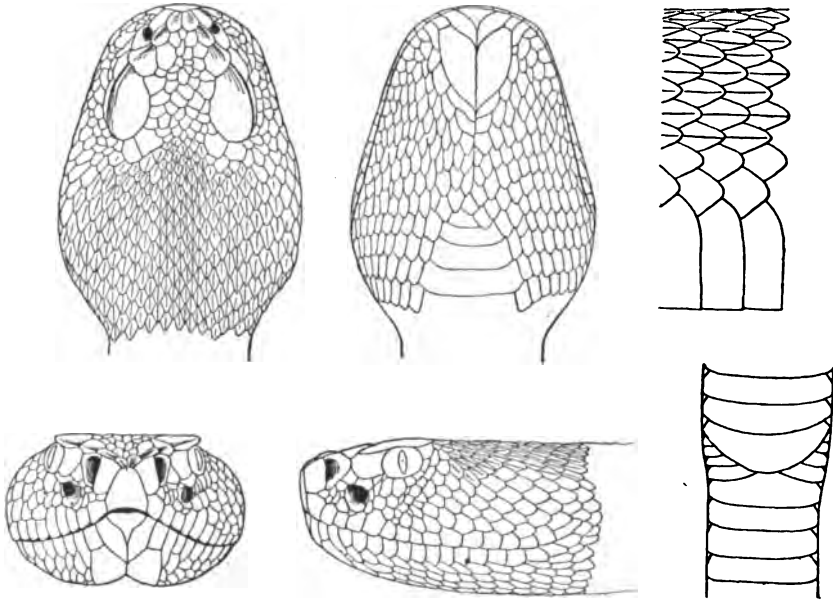


Fig. 334.

CROTALUS ADAMANTEUS ATROX BAIRD AND GIRARD.

= 1.

Brown County, Texas.

Collection of E. D. Cope.

same; the spots occupy one scale, or part of four contiguous ones. Space between these rhomboids and the yellowish lines is dull yellowish brown. Beneath nearly uniform yellowish, slightly clouded on the sides of the scales. On the tail the blotches are confluent into three or six dark brown half rings, interrupted on the under surface. General distribution of lines on the head much as in *C. a. adamanteus*; a narrow light line from the posterior end of the superciliary backward, directly to the angle of the mouth; a second from the anterior extremity, nearly parallel with the first, the two inclosing an indistinct patch, and separated on the labials by four and one-half scales. There is also a single narrow light line across the superciliary obsolete in old specimens.

It may readily be distinguished from *C. a. adamanteus* by its light color and the truncations of the rhomboids, as well as the general obsoleteness of the lateral markings. The rhomboids are longer in proportion and more rounded. The two lateral rows of scales are smooth, the next two more strongly carinated than in *C. a. adamanteus*. The fifth upper labial is largest, and transverse; the rest nearly uniform. The stripes on the head are less distinct. The last black band on the tail is not so wide, and does not embrace it so as to form a black termination of that organ. The subspecies *atrox* has in general the paler characters which western representatives of eastern species so often present, excepting in regard to the black bands of the tail, which are quite as deep in color as in the eastern *adamanteus*.

As compared with the *Crotalus confluentus*, which this subspecies resembles at first sight, these color characters always distinguish it. These are in the latter: First, the passage of the dark postocular band above the angle of the mouth; second, the absence of black rings on the tail, and third, the nourhombic form of the dorsal spots.

Cat. Nos.	Scale.	Upper labials.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.	Rattle. mm.
467	27.	15.	183.	28.			
4225	25.	15.	179.	27.			
12645	27.	16.	182.	18.			
9322	27.	16.			670.	170.	64.

Four specimens from near Cape St. Lucas, Lower California (Cat. No. 12645), all have two loreals as in the subspecies *adamanteus*. In all other respects these specimens are like the true *atrox*, except that in one the posterior canthal plate is smaller than usual, but not so small as in the subspecies *ruber*. A specimen (Cat. No. 467) from the Great Basin has the bleached appearance of the form *C. confluentus lecontei*, which inhabits the same region.

This form has the manners of the typical subspecies. I observed a pair of fully grown ones on the headwaters of the Colorado River in Borden County, Texas. They were rather sluggish. One I caught in a noose and suspended it on a stick until dead. The other one retreated among the rocks as fast as pursued, and was allowed to escape.

Crotalus adamanteus atrox Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
466	1	Gila and Colorado River..	.....	.....	Alcoholic.
467	1	do .....	.....	.....	do.
469	1	do .....	.....	.....	do.
7780	1	Indianola, Texas.....	.....	Col. J. D. Graham, U. S. A	do.
7781	1	do .....	.....	do	do.
255	1	do .....	.....	do	do.
4224	1	San Antonio, Texas .....	.....	Dr. S. W. Woodhouse	do.
1801	1	Eagle Pass, New Mexico .....	.....	.....	do.
273	1	San Bois, Choctaw Nation .....	.....	Lieut. A. W. Whipple, U. S. A.	do.
263	1	Santa Cruz .....	.....	Lieutenant Couch, U. S. A	do.
4713	1	Fort Buchanan, Arizona .....	.....	Dr. B. J. D. Irwin, U. S. A	do.
4225	1	Rocky Dell Creek .....	.....	Lieut. A. W. Whipple, U. S. A.	do.
476	1	Fort Yuma, California .....	.....	R. O. Abbott.....	do.

Crotalus adamantus atrox Baird and Girard—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
5290	1	Cape St. Lucas, L. California.	.....	J. Xantus	Alcoholic.
470	1	Gila and Colorado Bottom.	.....	A. Schott.....	do.
8998	1	.....	.....	.....	do.
9322	2	.....	— —, 1874	.....	do.
9208	1	Brookhaven, Mississippi.	.....	T. J. H. Keenan	do.
474	1	Tabac, Sonora .....	.....	Dr. Thos. Webb	do.
12645	4	La Paz, L. California	— —, 1882	L. Belding	do.
11781	1	Fresno, California	— —, 1879	Gustav Eisen	do.
8753	1	Arizona .....	.....	H. W. Henshaw	do.
14280	.....	Chihuahua, Mexico	— —, 1885	E. Wilkinson	do.
209	1	Brazos River, Texas .....	.....	Dr. B. F. Shumard	do.
7212	1	Between San Pedro and Comanche Springs.	.....	.....	do.
5184	1	Fort Stockton, Texas .....	.....	P. Duffy	do.
7765	1	Pacific R. R. survey, 32° .....	.....	Capt. John Pope, U. S. A.	do.
4226	1	Texas .....	.....	Dr. C. B. R. Kennerly	do.
14742-3	.....	Fort Huachuca, Arizona .....	.....	Benson	do.
15134	.....	Pidulguine Bay, Lower California.	.....	U. S. Fish Commission	do.
15660	.....	San Diego, Texas .....	.....	William Taylor	do.
19792	.....	Stanton, Milton County, Texas.	.....	Dr. J. R. Vance	do.
20849	.....	Fort Clark, Texas .....	.....	Dr. E. A. Mearns	do.
21824	.....	Colorado River, east bank 10 miles below U. S. border, Mexico.	.....	do.	do.
22046	.....	Laguna Station, New River San Diego County, California.	.....	do.	do.

CROTALUS RUBER Cope.

Crotalus adamanteus ruber COPE, Proc. U. S. Nat. Mus., XV, 1892, p. 690.—VAN DEN BURGH, Proc. Cal. Acad. Sci., 1896, p. 1007.

Crotalus atrox ruber STRJNEGER, Rept. Nat. Mus. for 1893, 1895, p. 439.

Muzzle shortened. Rostral plate a little wider than high; plates of upper side of canthus rostralis smaller than in other species, the posterior especially, being smaller than the anterior, and descend laterally, obliterating the canthus rostralis and the superior loreal. One loreal. Five rows of scales between orbit and labials; eight rows between superciliary plates.

The color is light red or reddish brown, marked above with deep red or reddish spots. These are of a longitudinally oval form anteriorly, but posteriorly they have a diamond-shaped form. They have no distinct lateral borders, either light or dark; but they are separated on the median line of the back by a single row of yellow-tipped scales. Traces of brownish-red indefinite spots opposite their lateral angles as well as their interiorals. Head without marking, except a faint trace of a pale line from the eye to the border of the mouth below it. Inferior surfaces, yellow. Tail, white with five black cross-bands, of which all but the first are complete rings.

Cat. No. 9209; scales, 27; upper labials, 17; gastrosteges, 186; urosteges, 26; total length, 1,245 mm. (with rattle); length of tail, 122 mm. (with rattle); rattle, 44 mm. (seven joints and a button).

The accession of three specimens besides the type, since its description, enables me to define this form more exactly, and to raise it to the

rank of a species. All the characters ascribed to it turn out to be constant, excepting that probably the red color is in some specimens replaced by chestnut brown. Its affinities are with the *C. adamanteus atrox*, but its general appearance is more like that of the *C. confluentus lucifer*. The cutting off of the labial part of the first inferior labial plate is present in all the specimens of the *C. ruber*. This is frequently

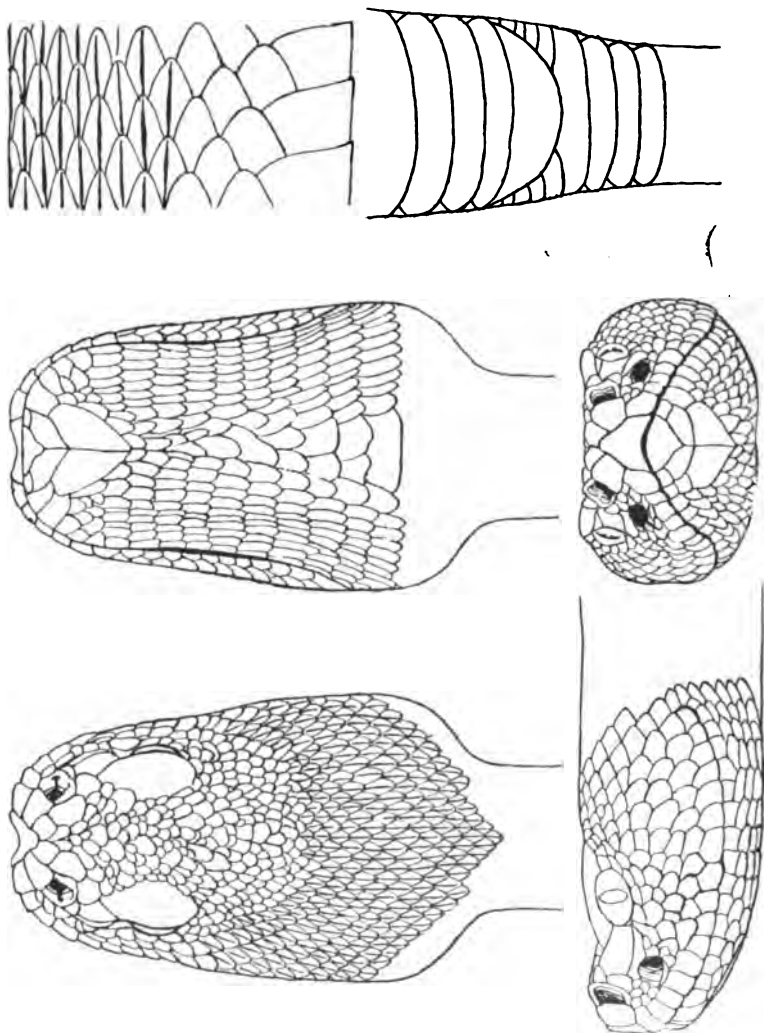


FIG. 335.
CROTALUS RUBER COPEI.
= 1.

Southern California.
Cat. No. 9909, U.S.N.M.

met with in *C. a. atrox*, but does not occur in any other species. The direction of the postocular band and the coloration of the tail is also as in *C. a. atrox*. On the other hand, the reversed relation of size between the internasal and posterior canthal (or lateral prefrontal) is not found in the *C. a. atrox* nor in any of the forms of the *C. adamanteus* or *C. confluentus*, and its lateral decurvature is only approached by some

specimens of the *C. c. lucifer*. It is in the dorsal coloration that the *C. ruber* resembles the *C. c. lucifer*, but the broad, ill-defined postocular band not passing beyond the canthus of the mouth and the white tail with black rings easily distinguish it from the common form of the Pacific coast.

This is a large species; besides Cat. No. 9209 above measured, Cat. No. 20381 measures 1,400 mm. and Cat. No. 19269; 1,130 mm.

Dr. Stejneger remarks¹ that the characters by which I originally defined this form "do not seem to hold in a larger series." I find on examining the same material that the characters are fully substantiated.

The habitat of the *C. ruber* is southern California as far north as San Francisco. Mr. Van Denburgh reports a head from Ensenada, in the adjacent part of Lower California, but as he remarks that the only peculiarity it presents is that of color the identification may be for the present regarded as doubtful.

In young specimens the color markings are better defined. This is the case with Cat. No. 8856, where the dorsal spots are rhombic on the posterior three-quarters of the body, and are parallelogrammic on the anterior fourth, and the pale lateral borders are very faintly indicated. Details as follows:

Cat. No. 8856; rows of scales, 29; upper labials, 15; gastrosteges, 194; urosteges, 21; total length, 600 mm.; length of tail, 52 mm.; rattle, 22 mm.

Crotalus ruber Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received..	Nature of specimen.
8856	1	San Francisco, California.	A. W. Chase	Alcoholic.
9209	1	Southern California.....	f.....	Type. Alcoholic.
19269	1	San Diego County, California.	F. W. Koch	Alcoholic.
20381	1	do	H. W. Henshaw.....	do.
	2	Lower California	A. W. Anthony	do.
22044		Mount Spring, San Diego County, California.	Dr. E. A. Mearns.....	do.
22045		Jamul Creek, El Nido post-office, San Diego County, California.	do	do.
20381		Witch Creek, San Diego County, California.	H. W. Henshaw.....	do.

CROTALUS CONFLUENTUS Say.

Crotalus confluentus SAY, Long's Exped. Rocky Mountains, II, 1823, p. 48.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 33.—COUES, Report U. S. Geog. Survey W. of 100th Mer., V, p. 604; Proc. U. S. Nat. Mus., XV, 1892, p. 691.—BOULENGER, part, Cat. Snakes Brit. Mus., III, 1896, p. 576.—COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 11.—STEJNEGER, Rept. U. S. Nat. Mus. for 1893, 1895, p. 440, pl. XII.

Top of muzzle with smaller scales between larger ones of the canthus rostralis. Rostral plate elevated, in contact with the prenasal. One or two loreals; three or four rows between eye and labial scales. Body

¹ Report U. S. Nat. Mus for 1893, 1895, p. 440.

scales in twenty-three to twenty-seven rows, all keeled except the external three on each side.

Color light brown, with one row of dark brown spots usually paler edged, on the median line of the back, which are generally longer than wide anteriorly, but soon become transversely oval, and ultimately assume the form of cross-bands. Tail of the same color as the body, with cross-bands of the color of the dorsal spots. Belly unspotted, but with dark shades in some forms.

Four well-defined subspecies are embraced in this species; they are defined as follows:

Cephalic scales larger; 4 rows between superciliary plates, 4 rows below orbit; dorsal spots and cephalic bands light edged; few posterior cross bands.... *confluentus*
 Cephalic scales intermediate; 6 rows between superciliaries; 3 rows below orbit (probably sometimes 4); dorsal spots square, with the head bands, not light edged; posterior cross bands more numerous; color dotted with brown specks.... *pulverulentus*
 Cephalic scales smallest; 8 rows between superciliaries; 4 rows below orbit; dorsal spots with light centers and brown borders light-edged or not; head bands obsolete; numerous posterior cross bands..... *lecontei*
 Head scales small as in *C. c. lecontei*; colors dark; dorsal spots and bands not pale, centered and closer together than in *C. c. lecontei*; head wide, rounded..... *lucifer*

The distribution of these subspecies is as follows: The typical one inhabits the plains including western Texas and southern California, also *C. c. lecontei* belongs to the Great Basin. The *C. c. pulverulentus* is a form of the Sonoran district; while the *C. c. lucifer* inhabits the Pacific district to its eastern limit, the northern Rocky Mountains.

CROTALUS CONFLUENTUS CONFLUENTUS Say.

Crotalus confluentus confluentus COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 692.

Crotalus confluentus SAY, Long's Exped. Rocky Mts., II, 1823, p. 48.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 8.—BAIRD, U. S. Pacific R. R. Surv. Rept., Whipple's Rept., p. 40; U. S. and Mex. Bound. Surv., Reptiles, 1859, p. 14.—COOPER and SUCKLEY, Nat. Hist. Wash. Ter., 1859, p. 295.—COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 11.

Figures, Sitgreaves's Exped. Colorado and Zuni, pl. XVIII (poor figure); U. S. Pac. R. R. Surv. Rept., Reptiles, pl. XXIV, fig. 4; Williamson's Rept. Reptiles, pl. III.—COOPER and SUCKLEY, Nat. Hist. Wash. Ter., pl. XII.

Plates on top of head squamiform, irregular, angulated, and imbricated; scales between superciliaries small, numerous, uniform. Four rows of scales between the suborbital series (which only extends to the center of the orbit) and the labials. Labials fifteen or eighteen, nearly uniform. Dorsal series twenty-seven to twenty-nine. Dorsal blotches quadrate, concave before and behind; intervals greater behind. Spots transversely quadrate posteriorly, ultimately becoming ten or twelve half rings. Two transverse lines on superciliaries, inclosing about one-third. Stripe from superciliary to angle of jaws, crosses angle of the mouth on the second row above labial. Rostral margined with lighter.

Scales on the top of the head anterior to the superciliaries nearly uniform in size. Line of scales across from one nostril to the other

consists of six, not four as in *C. atrox*. Superciliaries more prominent. Labial series much smaller. Upper anterior orbitals much smaller, as also is the anterior nasal. Scales on the top of the head less carinated. Scales between superciliaries smaller and more numerous, five or six in number instead of four. Two lateral rows of scales smooth, first, second, and third gradually increasing in size. Scales more linear than in *C. atrox*.

General color yellowish brown with a series of subquadrate dark blotches, with the corners rounded and the anterior and posterior sides frequently concave, the exterior convex. These blotches are ten or eleven scales wide and four or five long, lighter in the center, and margined for one-third of a scale with light yellowish. The intervals

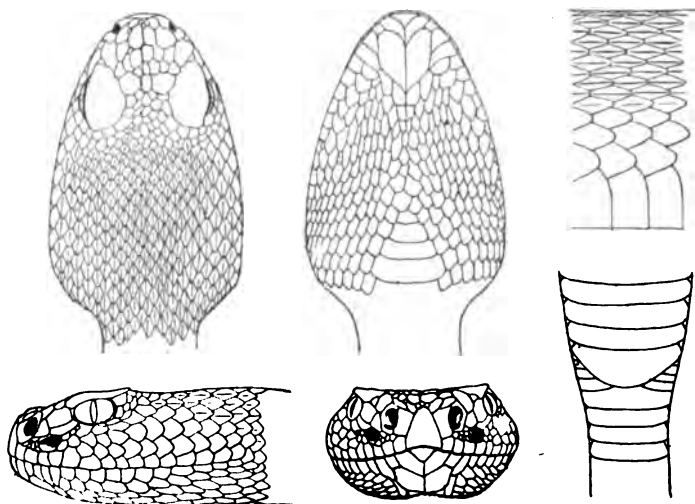


Fig. 336.

CROTALUS CONFLUENTUS CONFLUENTUS SAY.

= 1.

Western Texas.

Collection of E. D. Cope.

along the back light brown, darker than the margins of the blotches. Anteriorly the interval between the dark spots is but a single scale; posteriorly it is more, becoming sometimes two scales, where also the spots are more rhomboidal or lozenge-shaped; nearer the tail, however, they become transversely quadrate. The fundamental theory of coloration might be likened to that of *Crotalus adamanteus*, namely, of forty or fifty light lines decussating each other from opposite sides; but the angles of decussation, instead of being acute, are obtuse, and truncated or rounded off throughout. Along the third, fourth, and fifth lateral rows of scales is a series of indistinct brown blotches covering a space of about four scales and falling opposite to the dorsal blotches; between these blotches, and opposite to the intervals of the dorsal blotches, are

others less distinct. Along the fifth, sixth, seventh, and eighth rows is a second series of obsolete blotches, each covering a space of about four scales, and just opposite the intervals between the dorsal spots. The dorsal and lower series are separated by an interval of three scales, this interval light brown. Beneath, the color is dull yellowish, and ten or twelve darker half rings are visible on the tail.

In point of coloration the principal features, as compared with *C. a. atrox*, lie in the dorsal blotches, being disposed in subquadrate spots instead of subrhomboids; the intervals thus forming bands across the back perpendicular to the longitudinal axis. This tendency to assume the subquadrangular pattern has broken up the chain-work into isolated portions, as in *Oseola doliata triangula*, or *Sistrurus tergeminus*. The intervals of the dorsal blotches are wide and darker in the middle, while in *C. a. atrox* they are narrow, not linear, and unicolor. The sides of the head present the usual light stripe from the posterior extremity of the superciliary; it passes, however, to the angle of the jaw on the neck, along the second row of scales above the labials. A second stripe passes in front of the eye to the labials, widening there. A small light vertical bar is seen below the pit, and another on the outer edge of the rostral. On the superciliaries are seen two light transverse lines inclosing a space nearly one-third of the whole surface. In *C. a. atrox* there is a single median line. Sometimes, as in *U. a. atrox*, the single blotches on the nape are replaced by two elongated ones parallel to each other.

Cat. Nos.	Scales.	Upper labials.	Gastroteges.	Urostegea.	Length. mm.	Tail. mm.	Rattle. mm.
264.....	27.	14.	185.	24.			
8395.....	25.	14.	175.	23.			
9318.....	27.	15.	173.	24.	895.	114.	50.

Crotalus confluentus confluentus Say.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
4251	1	San Francisco, California.....		H. B. Mollhausen.....	Alcoholic.
8396	1	Rush Lake, Arizona.....	Aug. —, 1873	H. W. Henshaw.....	do.
8145	1	Camp Grant, Arizona.....	— —, 1872	E. Palmer.....	do.
8395	1	Apache, Arizona.....	Aug. —, 1873	Dr. C. G. Newberry.....	do.
4227	1	Red River, Arkansas.....		Capt. R. B. Marcy, U. S. A.	Alcoholic type.
8128	1	Snake Valley, Nevada.....	— —, 1872	Dr. H. C. Yarrow.....	Alcoholic.
8399	1	Fort Wingate, New Mexico.	July 26, 1873	H. W. Henshaw.....	do.
4230	1	Pole Creek, Nebraska.....		Dr. W. A. Hammond, U. S. A.	do.
264	1	Oregon.....		Dr. C. B. R. Kennerly.....	do.
4228	1	San Antonio, Texas.....		Col. J. D. Graham, U. S. A.	do.
8129	1	Provo, Utah.....	— —, 1872	Dr. H. C. Yarrow.....	do.
7841	1	Utah.....		A. Clough.....	do.
292	1	Republican River.....			do.
260	1	Rio San Pedro, Texas.....		Dr. C. B. R. Kennerly.....	do.
4231	1	Yellowstone.....		Dr. F. V. Hayden.....	do.
4229	1	Cache la Poudre River.....			do.
282	1	Milk River, Montana.....		Governor Stevens.....	do.
283	1	Fort Lookout.....		Dr. F. V. Hayden.....	do.
4658	1	Utah.....	Aug. 9, 1859		do.
8143	1	Rush Lake, Utah.....	— —, 1872	Dr. H. C. Yarrow.....	do.
9319	1	Montana.....		Dr. E. Cones, U. S. A.....	do.
9318	1	Camp Thorne.....	July —, 1878	Prof. J. A. Allen.....	do.
8598	1	Kern River, California.....	Sept. —, 1875	H. W. Henshaw.....	do.

Crotalus confluentus confluentus Say—Continued.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
9519	1	Pyramid Lake, Nevada	May 27, 1877	H. W. Henshaw	Alcoholic.
9958	1	Sydney, Nebraska	Feb. 10, 1876	Lieut. E. Crawford, U. S. A.	do.
11729	1	Camp "12," Nevada	July —, 1867	Robert Ridgway	do.
284	1	Fort Union, New Mexico			do.
9094	1	(?)			do.
8564	1	Los Coronados Island, Lower California.		T. H. Streets	do.
5021	1	Fort Buchanan, Arizona		Dr. J. B. D. Irvin	do.
11765	1	Fresno, California.		G. Eisen	do.
11781	1	do		do	do.
11585	1	Truckee River, Nevada.	July —, 1867	Robert Ridgway	do.
8755	1	San Mateo, Arizona.	Oct. —, 1875	H. W. Henshaw	do.
4232	4	Near 32° latitude		Capt. John Pope, U. S. A.	do.
9318	1	Yellowstone River	July —, 1873	Prof J. A. Allen	do.
4618	1	Fort Kearney		C. McCarthy	do.
1298	1	Wagon road to Bridgers Pass, Wyoming.		W. S. Wood	do.
4962	1	Pecos River, Texas		Capt. John Pope, U. S. A.	do.
10351		Near Orcutt, San Diego County, California.		C. R. Orcutt	do.
16352		Mountain, San Diego County, California.		do	do.
2274		Banner, Trego County, Kansas.		National Zoological Park	do.
22821		Banner, Trego County, Kansas.		do	do.
22724-27				do	do.
22729				do	do.
22730-31		Trego County, Kansas		do	do.

This rattlesnake is a universal companion of the prairie marmot, *Cynomys ludovicianus*. I have observed them together from near the Canadian border in Montana to the southern extremity of the staked plains in central western Texas. Not only do the marmots provide them food, but their burrows furnish them a safe refuge. In some regions the wild rat *Neotoma* does the same service. I well remember a large *Crotalus* which dwelt in apparent harmony with a rat and her family near a camp north of Clarendon, in the Panhandle of Texas. Both the snake and the rat were fat, but no young rats were in sight.

This is the familiar rattlesnake of the plains. They are frequently found near the camp of the traveler, and, like others of their genus, inflict no injury unless provoked or hurt. The bite is, however, frequently fatal if fairly delivered. When the head is raised in the act of attack the light stripes of the muzzle and lips present a handsome appearance.

Dr. H. A. Brons gives his experience of the relations between the rattlesnake, prairie marmot, and the prairie owls in the following language:¹

Prairie dogs (*Cynomys ludovicianus*) seem to have a most intense dread of rattlesnakes (*Crotalus confluentus*). This little animal dreads not only its venomous bite, but more the loss of its young, which serve as food for these snakes that enter their burrows, take possession, and drive them from their homes. Where does one find a prairie-dog town but that it is teeming with snakes and the strange little owl (*Speotyto cunicularia*) that "ducks" to passers in ludicrous solemnity? These do

¹ American Naturalist, XVI, 1882, p. 565.

not constitute a happy family. The owls, though they generally occupy an abandoned hole or burrow, destroy the young dogs. Nor do the eggs and nestlings of the owls fare with any better treatment from the snakes; between these exists much enmity. One afternoon, while passing through one of these dog towns in Wallace County, Kansas, we heard a most unusual noise and stir (in the town), as though they were holding a bellicose council. They were collected around a hill, into which they were scraping dirt vigorously. On examining the burrow it was found to contain a large rattlesnake that the dogs were trying to entomb. I noticed this several times, as did other members of our party. To leave no doubt upon the subject, we dug out the snakes after shooting them.

CROTALUS CONFLUENTUS PULVERULENTUS Cope.

Crotalus confluentus pulverulentus COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 11;
Proc. U. S. Nat. Mus., XIV, 1892, p. 692.

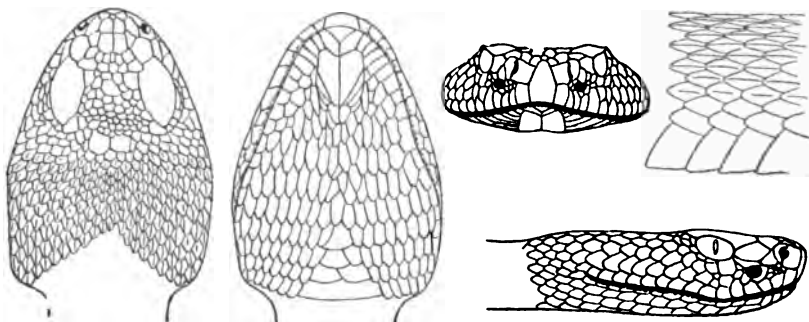


Fig. 337.

CROTALUS CONFLUENTUS PULVERULENTUS COPE.

= 1.

Type.

Lake Valley, New Mexico.

Collection of E. D. Cope.

Cephalic scales intermediate; six rows between superciliaries; three rows below orbit (probably sometimes four); dorsal spots square, with the headbands, not light edged; posterior cross bands more numerous; colors dotted with brown specks. The ground is a yellowish brown, and the belly is light yellow. The dorsal spots are a darker brown, and are composed of dense punctulations of uniform tint throughout. Bands on head indistinct.

The *C. c. pulverulentus* at first sight resembles the *Orotalus mitchelli*, having much the same coloration, but the head scales and plates are quite different. It gives out a powerful musky odor when excited, which I have not noticed in the typical form of the species.

I have two specimens in my collection which I took near Lake Valley, Sierra County, New Mexico, about 60 miles north of the border of Mexico. I nearly stepped on one of them on a hot day, and he violently resented the intrusion. At a safe distance I annoyed him by tossing pebbles, sticks, etc., at him, and he made unsuccessful efforts to reach me. As he lay with head erect and mouth open, the poison

dripped from his fangs and, with his violent expiration or hisses, was thrown toward, without reaching me. My ascription of this habit to rattlesnakes in my Synopsis of Snakes of North America¹ brought out in the pages of Forest and Stream some vigorous protests and assertions that I was quite in error. Among my critics was Capt. Charles Bendire, who has seen a great deal of rattlesnakes in the West. However, the circumstance occurred as I now state it. At the same time it is the only time that I have observed it. The habit is probably not common among rattlesnakes, but it is nevertheless usual among venomous snakes, and the genus *Crotalus* is not likely to be an exception.

CROTALUS CONFLUENTUS LECONTEI Hallowell.

Crotalus lecontei HALLOWELL, Proc. Acad. Nat. Sci. Phila., VI, 1852, p. 80; Sitgreaves's Rept. Exped. Zuni and Colorado Rivers, 1853, p. 139; U. S. Pac. R. R. Rept., X, Williamson's Rept., 1859, p. 18.

Crotalus confluentus lucifer COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 11.

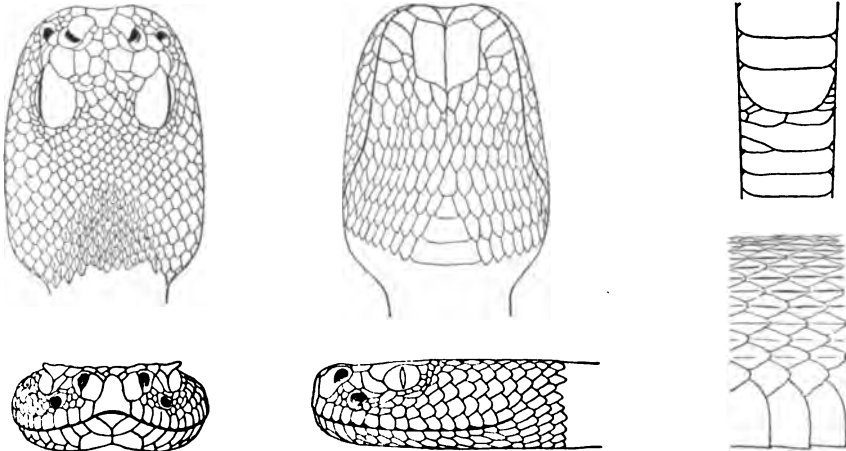


Fig. 338.

CROTALUS CONFLUENTUS LECONTEI HALLOWELL.

= 1.

Rush Lake, Utah.

Cat. No. 8143, U.S.N.M.

This form is the *C. confluentus* of the Great Basin. Although it is quite different from the typical *C. confluentus*, I can not distinguish it as a species. It is indeed more closely allied to the Californian subspecies *C. c. lucifer*, and although it is not difficult to distinguish most individuals of the two, the differences rest largely on color and form of the head and other features of no great constancy.

Cephalic scales smallest; eight rows between superciliaries; four rows below orbit; dorsal spots and headbands light-edged or not; numerous posterior cross-bands. The general appearance is that of a

¹ Proc. U. S. Nat. Mus., XV, 1892, p. 687.

bleached-looking *C. c. confluentus*, with a peculiarity in the dorsal spots. These consist of a dark brown circumference only, the centers differing little from the ground color. The bands and stripes on the head are wanting or obsolete, the postorbital being faintly indicated. Instead of these there are irregular blackish splotches more or less confluent on the top of the head between the orbits and behind that region. The tail bands are very distinct.

Cat. No. 4617; rows of scales, 25; upper labials, 16; gastrosteges, 169; urosteges, 23; total length, 828 mm. (with rattle); length of tail, 97 mm. (with rattle); rattle, 48 mm.

This subspecies agrees with the *C. c. lucifer* in the small size of the scales which cover the head, but differs from it greatly in color. While this forms the palest of the subspecies, the *C. c. lucifer* is the most deeply colored, in agreement with the general law of Allen, namely, that the pale types inhabit dry regions, and the dwellers in moist climates are more heavily pigmented.

Crotalus confluentus lecontei Hallowell.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
4617	1	Steptoe Valley, Utah.....	Captain Simpson	Alcoholic.
8143	1	Rush Lake, Utah	Dr. H. C. Yarrow.....	do.

I have also specimens from Pyramid Lake, northwest Nevada, and from Warners and Silver lakes, Oregon. These localities are all in the dry and barren region of the Great Basin, on the eastern side.

CROTALUS CONFLUENTUS LUCIFER Baird and Girard.

Crotalus lucifer BAIRD and GIRARD, Proc. Acad. Nat. Sci. Phila. (1853), p. 177, and Catalogue, 1852, p. 6.—GIRARD, Herp. U. S. Expl. Exp., 1858, p. 187.—BAIRD, U. S. Pacific R. R. Rept., X, Williamson's Report, 1859, p. 10.—COOPER and SUCKLEY, Nat. Hist. Wash. Terr., 1859, p. 295.

Figures, U. S. Pac. R. R. Surv. Rept. Reptiles, Williamson's Rept. Reptiles, pl. XI.—GIRARD, Herp. U. S. Expl. Exp., pl. xv, figs. 1-6.

Head short, muzzle broad. Scales between the superciliaries numerous, small, and uniform. Plates on top of head, four prefrontal, four postfrontal, or else irregular. Three rows scales between the suborbitals and labials. Labials sixteen above, first and fifth largest; fifteen below. Dorsal rows twenty-five, exterior smooth, second and third with obsolete carination. Tail and posterior portion of body with sixteen or seventeen half rings. A succession of brown dorsal hexagons or octagons, separated throughout by a narrow lighter line. Light stripe from superciliary crosses the angle of the mouth on the third and fourth row above labial.

Head very broad anteriorly, outline little tapering. Head above covered with many small tuberculiform scales, showing a substelliform radiation. Interval between superciliary plates filled with small scales, nearly uniform in size; row bordering the superciliaries very small.

Scales in front of the superciliaries variable. In one specimen there are two rows of four each, of considerable size; in another they are larger than the rest, but irregular. Scales on the cheeks large, flat, smooth.

Ground color, light brown above. Along the back a series of sub-hexagonal or octagonal blotches, formed by a skeleton of dull yellowish, constituting a dorsal chain. The space thus inclosed of the ground-color is margined faintly with dark brown. The width of the interval between the successive blotches is from one-half to one and a half scales. These spots are frequently confluent, two and three running together. Where most distinct the spots are four scales long and eleven wide. On each side of this dorsal series is a second, separated by a single row of scales, the blotches extending from the abdominal scutellæ to the fifth or sixth row. These are smaller than the dorsal

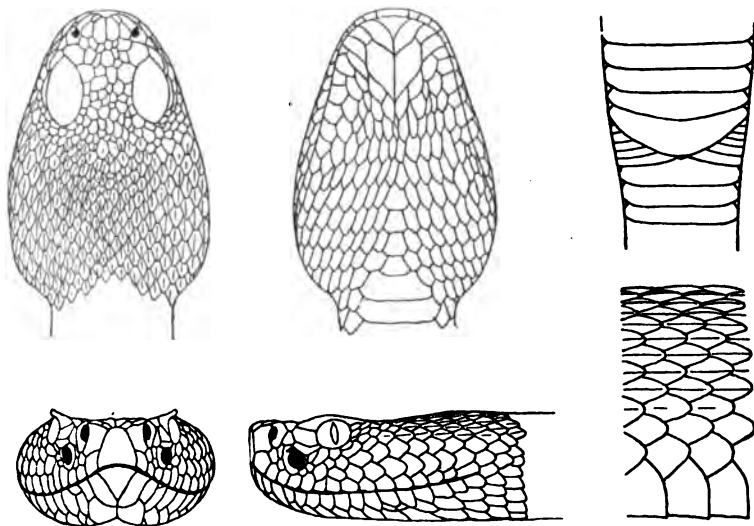


Fig. 339.

CROTALUS CONFLUENTUS LUCIFER BAIRD AND GIRARD.

= 1.

San Francisco, California.

and subcircular. Opposite the transverse light bands, and in the open space between four contiguous blotches on the sides, smaller blotches are indistinctly visible. Posteriorly the spots on the back and sides are confluent and darker, in one specimen forming seventeen half rings, encircling the back, leaving about twenty-four dorsal blotches. Abdomen greenish yellow, more or less clouded with brown at the bases of the scales. Head dark brown; a light line from posterior portion of the superciliaries along the fourth row of supralabial scales back to the angle of the jaws, on the occiput, where it expands into the color of the under part. Upper labials of the same light color behind, rapidly widening anteriorly so as to include whole front and side of the face, leaving only the top of the head dark. The space about the facial pit darker.

The theory of coloration is that of decussating lines, which, when they intersect, unite so as to have the angles of intersection truncated.

The species has a general resemblance to *C. a. atrox* in the arrangement of the blotches, but is darker, and has about seventeen dark half rings posteriorly instead of four or five. In *C. a. atrox* the head is narrower and more triangular, the space between the superciliaries narrow, and occupied by angulated larger scales instead of small tuberculous ones. In *C. a. atrox* the row bordering the superciliaries is much larger than the rest, and the scales on the top of the head generally more angulated. In *C. c. lucifer* the line on the side of the head, instead of going directly from the posterior end of the superciliary to the commissures, passes back nearly parallel to the mouth, crossing along the fourth row of scales above the labial. The second line in front of the eye is much wider below in *C. c. lucifer*, and the face generally shows more of white, while the dark portions are much darker.

In small specimens the colors are much brighter and the pattern better defined. Such individuals graduate into the *C. c. confluentus* of corresponding age which are found in southern California. On the other hand, the large specimens become obscure in the pattern of coloration, and lose various marks; for instance, the superior border of the postocular band and the lateral borders of the dorsal spots. This form is simply the dark-colored phase of *C. confluentus*, characteristic of a relatively wet climate.

As already remarked, this subspecies is directly connected with the typical one *C. c. confluentus* by the intermediate form *C. c. lecontei*. This gradation is especially evident in specimens from the mountains of Arizona, where the colors are apt to be dark; as for instance in specimen, Cat. No. 8397.

Cat. No.	Scales.	Upper labials.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.	Rattle. mm.
4254.....	25.	15.	169.	26.	1,034.	142.	65.
373.....	25.	15.	157.	23.			
8397.....	23.	16-17.	177.	23.			
7762.....	25.	16.	168.	25.			

Dr. Stejneger, in his report upon the reptiles of the Death Valley Expedition, says:

The present species is characteristic of the interior valley and slopes of California as contrasted with the Great Basin, and the boundary between the two forms seems to be quite sharply drawn, at least in the regions visited by the expedition. There is probably no stronger contrast among the reptiles of the same genus met with by the Death Valley explorers than that between the pale and clay-colored rattlesnakes in the desert plains [*C. c. lecontei* E. D. C.] and mountains, and the dark-colored *C. lucifer* which they obtained only in the San Joaquin Valley and in the mountain slopes encircling it.

The distribution of this subspecies is given by Dr. C. Hart Merriam in the same publication, as follows:

This species does not inhabit the Great Basin, but was found in a number of localities on the west or costal slope of the Sierra, and in the San Joaquin Valley. Speci-

mens were obtained at Old Fort Tejon, in the Cañada de las Uvas, and thence northward on the west slope of the mountains to Tehachapi Pass, Kern Valley, Kaweah River, Kings River Canyon, the San Joaquin River, and the Merced River (on the latter as high as 2,620 meters, or 8,600 feet).

Crotalus confluentus lucifer Baird and Girard.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
7762	1	Oregon			Alcoholic type.
4234	1	Fort Umpqua, Oregon		Dr. E. P. Vollum, U. S. A.	Alcoholic.
8397	1	White Mountains, Arizona.		H. W. Henshaw	do.
370	1	California		Dr. C. B. R. Kennerly	do.
371	1	do		do	do.
873	2	San Francisco, California.		R. D. Cutts	do.
4254	2	Fort Tejon, California.		J. Xantus	do.
9959	1	Santa Catalina Island, California.	— —, 1876	P. Schumacher	do.
10774	1	Near Camp Harney, Oregon.		Capt. Charles Bendire, U. S. A.	do.
10813	1	Columbia River, Oregon.	Sept. 19, 1878	H. W. Henshaw	do.
10608	1	Santa Barbara, California.	July —, 1875	do	do.
10914	1	Fort Walla Walla, Washington.	June —, 1881	Capt. Charles Bendire, U. S. A.	do.
376	1	Blue Mountains, Oregon.		Dr. Geo. Suckley, U. S. A.	do.
13799	1	Baird, Shasta County, California.		C. H. Townsend	do.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When collected.	From whom received.	Remarks.
			Feet.	1891.		
18675	Adult.	Old Fort Tejon, California		July 7	Palmer	
18676	Young	Bakersfield, California		July 17	Bailey	
18677	Adult.	Kernville, California	2,400	July 10	do	
18678	Young	Soda Springs, North Fork Kern River, California.		Aug. 12	do	
18679	Male ..	East Fork Kaweah River, California.	4,500	July 28	do	Skin.
18680	Adult.	Kings River Canyon, California.		Aug. 14	Palmer	
18681	Adult.	North Fork San Joaquin River, California.	6,000	July 29	Nelson	
18682	Adult.	Merced River, California	8,000	Aug. 4	do	
18683	Adult.	do	8,600	do	do	

Catalogue No.	Locality.	From whom received.
15498-9	California	Dr. C. B. R. Kennerly.
20538	San Jacinto Mountains, California	F. Stephens.
22042	Campo, San Diego County, California	Dr. E. A. Mearns.
22043	Coast Range, summit Mexican boundary line, San Diego County, California.	do.
20207	Witch Creek, Santa Ysabel, San Diego County, California.	H. W. Henshaw.

CROTALUS POLYSTICTUS Cope.

Crotalus polystictus COPE, Proc. Amer. Phil. Soc., 1885, p. 179.—DUGÈS, *Naturelleza* (2), I, 1888, p. 134.—COPE, Proc. U. S. Nat. Mus., XIV, 1892, p. 689.—GÜNTHER, Biol. Centr. Am., Rept., 1895, p. 192.—BOULENGER, Cat. Snakes Brit. Mus., III, 1896, p. 582.

Caudisona polysticta COPE, Proc. Acad. Nat. Sci. Phila., 1865, p. 191; 1866, p. 309.

Crotalus lugubris JAN, part, Rev. and Mag. Zool., 1859, p. 156.

Crotalus lugubris var. *multimaculata* JAN, Icon. Gén., Pt. 46, 1874, pl. III, fig. 3.

Crotalus jimenezii DUGÈS, *Naturelleza*, IV, 1876, p. 23, pl. I, figs. 18-20.

The superciliary plates are normal; the rostral higher than broad, acuminate; two marginals between them, the anterior pair linear, sepa-

rated by a small plate, the posterior broad oval, separated by two rather narrow plates. Three between the superciliaries, the outer large. Two nasals, two loreals, one above the other. Superior labials fourteen, separated from the orbit by two rows of smooth scales; inferior labials thirteen; temporals smooth. Rows of scales twenty-seven, all keeled, except the outer two. Gastrosteges 123, urosteges 19, the first only divided. Crepitaculum slender, acuminate, delicate for the size of the animal; joints eleven. The color above is laterally gray brown, medially yellowish brown, marked by seven longitudinal series of brownish black spots; these alternate; the inferior involves the tips of the gastrosteges; the median embraces the largest spots, eight and nine scales wide, which are occasionally subdivided, the halves alternating. The tail is brown, crossed by three pairs of dark-brown bars.

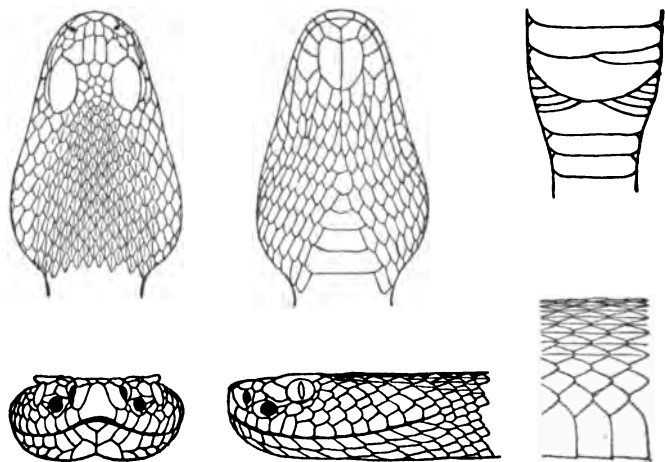


Fig. 340.

CROTALUS POLYSTICTUS COPE.

= 1.

Guanajuato, Mexico.

Lips pale, with a spot below the pit and one behind the eye to near the canthus of the mouth. A dark band convex forwards extends between the eyes and is continued below the eye nearly to the labial border. A pair of blackish bands form a V-shaped figure, the limbs diverging over the temples, each followed by a spot; two small round spots in the angle of the V, and a broad divergent band from the occiput on each side of the nape. Below pale, each scute with a broad basal border of blackish spots and punctulations.

Length of rictus of mouth, 22.5 mm.; breadth between eyes, 10.5 mm.; length of tail, 32 mm.; of rattle, 27 mm.; total, 593 mm.

This elegant species has been found at Guanajuato by Dr. Dugès, and at other points on the Mexican plateau, and in the valley of Mexico, but has not yet been taken within the limits of the United States.

CROTALUS TIGRIS Kennicott.

Crotalus tigris KENNICOTT, U. S. and Mex. Bound. Surv., II, 1859, p. 14.—COPE, in Yarrow, U. S. Geog. Survey W. 100th Merid., V, 1875, p. 534.—COPE, Checklist N. Amer. Batr. Rept., 1875, p. 33.—STEJNEGER, Report U. S. Nat. Mus. for 1893, 1895, p. 449, pl. xiv.

Figures, U. S. and Mex. Bound. Surv., II, pl. iv.

Size not large. Head oval, the muzzle short and obtuse with short and indistinct canthus rostralis. Rostral plate triangular, not higher than wide, in contact with prenasal. Postnasal and preorbitals short, not in contact; one or two loreals. Two or three rows of scales below orbit. Top of muzzle and interorbital space with small flat smooth scales of about equal size, the posterior canthal scale only being larger. Supraorbital scuta more or less divided by a transverse suture or groove,

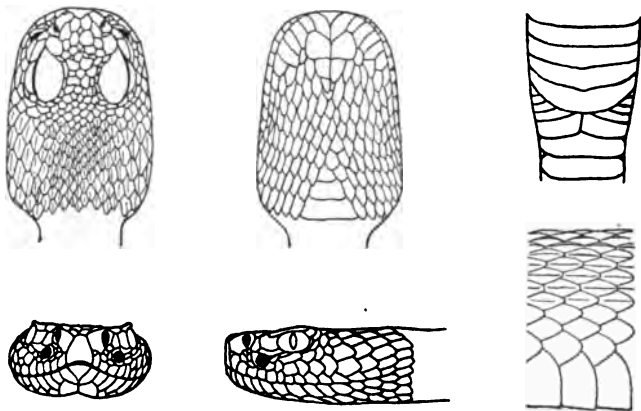


Fig. 341.

CROTALUS TIGRIS KENNICOTT.

= 1.

Sierra Verde, New Mexico.

Cat. No. 471, U.S.N.M.

a branch from which cuts off more or less completely a part of the margin. Five or six rows between supraorbitals. Scales on cheek and back of head keeled. Body scales not narrowed, all keeled, except the inferior three rows on each side.

The ground color of the alcoholic specimens is a light yellowish gray above and a dirty white below. The median dorsal line is crossed by numerous transverse hexagons of a brown color, which is punctulated with a darker brown. The interspaces of two scales on the middle line are pigmented probably yellow in life. On the inferior four or five rows of scales opposite the lateral angles of the hexagons is a series of vertical brown bars or spots. Near the anterior fourth of the length these fuse with the hexagons, forming cross-bands, which continue to the end of the tail. They are wide at the middle and narrow at the sides of the body, and are separated on the median line above by the pigmented

spaces. Gastrosteges with brown and gray shades at their extremities at points alternating with the dorsal and lateral spots; otherwise without markings. Tail colored like the body, buff with brown cross-bands except at the extremity, where there are two black cross-bands.

The colors of the head are indistinct. There is a brownish-gray postocular band which extends to the angle of the mouth, the superior border not well defined, the inferior one a yellowish band, which is as wide as the eye and reaches the labial border below it. A large spot on each side of the nape above the suspensorium of the lower jaw, which sends forward a shade to the inner border of the superciliary plate on each side. Superciliary and nasal plates paler than the others.

Cat. No. 5271 differs in several respects from the types (Cat. Nos. 471, 472). The dorsal and lateral spots do not unite into cross bands anterior to the tail. The lateral spots are represented by traces only on the anterior third of the length. The dorsal spots have brown borders, while the interiors are but little darker than the ground color, and are not punctulate. The interspaces are not yellow. The head markings, except the postorbital band, are wanting.

Cat. Nos.	Scales.	Upper labials.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.
5271 (rattle cut off).....	25.	14.	170.	23†+.	653.	45+†
471.....	23.	14.	170.	21.		

The large number of specimens of this species obtained by the Death Valley exploring expedition enables me to add considerably to the knowledge of its characters. The division of the supraorbital plate is present in all of the new specimens, but in various degrees. It is indistinctly indicated in one of the types, and may have been indicated in the other, but have been obliterated by long soaking in weak spirits. This division, when complete, is into three parts—an anterior smaller and a posterior larger, and a still smaller marginal, produced by the bifurcation of the transverse suture. This marginal scute is frequently only half defined. This structure is, in some of its conditions, probably similar to that which gave origin to the horn of the *C. cerastes*, which is a prolongation of a fold of the supraorbital plate defined by two grooves. The number of loreal plates varies from one to three, but one is the more common number.

This species is nearest the *C. enyo* Cope of the Lower Californian Peninsula. It differs from that species in the smoothness of the head scales, which are strongly carinate in *C. enyo*; also in the presence of keels on all the body scales, except sometimes one row, instead of the five and six smooth rows on each side. The color is materially different, since the *C. tigris* is a pale form apparently adapted to desert surroundings, while the colors of the *C. enyo*, especially the head bands, are bright and strong. The pattern is not very different, but the lateral angles of the dorsal hexagons have a black apex in the *C. enyo*, which is wanting in *C. tigris*, and head bands are wanting or very indistinct.

The distribution of this species is commented on by Dr. Stejneger in his report on the reptiles of the Death Valley expedition as follows:

The "tiger rattler," of which the expedition has brought home quite a series, is one of the rarest species in collections. Discovered during the survey of the boundary between the United States and Mexico, and described by Kennicott, the habitat of the species was given in general terms as "Deserts of Gila and Colorado," but I can find no evidence of specimens recorded from anywhere except from the Sierra del Pozo Verde,¹ in Arizona. A specimen was afterwards collected by Dr. Irwin at Fort Buchanan, Arizona, and recorded by Dr. Yarrow in his Catalogue of the Reptiles and Batrachians in the U. S. National Museum (No. 5271). Dr. J. G. Cooper has since enumerated *C. tigris* from the California side of the "Colorado Valley," but whether he based his record upon specimens actually collected (in which case, probably near Fort Mohave), or only upon the general statement in the report of the Mexican Boundary Survey, I do not know.

It does not appear to have been collected by any of the many parties of the Pacific Railroad Surveys, nor was it brought home by the herpetologists of the Wheeler expedition west of the one hundredth meridian.

The extension of its known range by the present expedition is therefore very material, and is the more interesting since it was found almost over the entire desert area visited. So far from being restricted to the Colorado Valley proper, as surmised by Dr. Cooper, it seems to be chiefly confined to the desert mountain ranges, in which it ascends to a considerable altitude, as shown by the table below, while horizontally its range has been extended over quite a considerable area of southern Nevada.

A study of the present series convinces me that the nearest affinity of the "tiger rattler" is with the true *Crotalus confluentus* of the plains, in spite of the rather striking and, in many respects, peculiar aspect of the former.

Dr. Merriam gives the following note in his report on the results of the Death Valley expedition:

The known range of this exceedingly rare rattlesnake has been greatly extended by the expedition, specimens having been secured at frequent intervals from Owens Valley, in California, to the Great Bend of the Colorado, on the boundary between Nevada and Arizona. It was usually found in rocky places in the desert ranges—rarely in the intervening valleys.

When passing through Emigrant Canyon, in the Panamint Mountains, in California, April 15, two large rattlesnakes of this species were killed at one shot by Mr. Stephens, at an altitude of 1,400 meters (4,600 feet). They were on a ledge of rock, and were standing erect with their heads near together, apparently playing. In Indian Spring Valley, north of the Charleston Mountains, in Nevada, one was found in a wood rat's nest that was dug open to secure a large scaly lizard (*Sceloporus magister*) which had taken refuge there. Its stomach contained a kangaroo rat (*Dipodomys*) and a pocket mouse (*Perognathus*), indicating nocturnal habits. Others were killed in the upper part of Vegas Valley (near Cottonwood Springs) and Vegas Wash, Nevada, and in Owens Valley (on Independence Creek), Coso Valley, the Argus Range Slate Range, Panamint Range, and Grapevine Mountains, California. In the Argus Range nineteen were killed in or near Shepherd Canyon, during the latter part of April and first week of May, by Dr. Fisher's party.

¹The name is written both Sierra del Pozo Verde and Sierra Verde in the Rept. U. S. and Mex. Bound. Surv. (See I, Pt. 1, p. 121, and Pt. 2, p. 70). This range is situated on the boundary between Arizona and Sonora, nearly due south of Baboquivari Peak, and about 50 miles northwest of Nogales. A spring known as Agua del Pozo Verde (Green Well) is situated at the foot of the western slope near the southern end of the range.

Crotalus tigris Kennicott.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
471	1	Sierra Verde, New Mexico.	A. Schott	Alcoholic.
472	1	do.....	do.....	do.
473	1	do.....	do.....	do.
5271	1	Fort Buchanan, Arizona.	Dr. B. J. D. Irwin, U. S. A.	do.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	When collected.	From whom received.	Remarks.
			Feet.	1891.		
18661	Adult.	Vegas Valley, Nevada		May 1	Merriam	3,000 feet above salt wells.
18662	Adult.	Vegas Wash, Nevada		May 2	Bailey	
18663	Young	Indian Spring Valley, Nevada		May 29	Merriam	
18664	Young	Grapevine Mountains, Nevada		June 6	Nelson	
18665	Adult.	Slate Range, California	3,100	Apr. 21	Stephens	
18666	Adult.	Panamint Mountains, Willow Creek, California.	5,500	May 17	Nelson	
18667	Young	Panamint Mountains, Johnson Canyon, California.	5,000	Mar. 30	Fisher	
18668	Adult.	Panamint Mountains, Emigrant Canyon, California.	4,600	Apr. 16	Stephens	
18669	Adult.	do.....	4,600	do.....	do.....	
18670	Adult.	Argus Range, Shepherd Canyon, California.		Apr. 29	Fisher	
18671	Adult.	do.....		Apr. 27	do.....	
18672	Adult.	Coso Valley, Maturango Springs, California.		May 11	Palmer	
18673	Adult.	do.....		do.....	do.....	
18674	Female adult.	Owens Valley, Independence Creek, California.	6,500	June 20	Stephens	

CROTALUS PRICEI Van Denburgh.

Crotalus pricei VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, p. 856.

I copy the following description from Van Denburgh, as I have not seen the species:

Small; internasal and prefrontal plates large; anterior nasal in contact with rostral; supraocular normal; nine supralabials; 153-159 gastrosteges; two rows of small dorsal spots; belly dark slate.

Head subtriangular; rostral nearly as broad as high; two nasal, one loreal, and two preocular plates; two internasals; four prefrontals; one to three rows of scales between supraoculars; nine supralabials; nine infralabials, first pair in contact on the median line; one row of scales between labials and orbit; scales in twenty-one rows, parts of the lower two smooth; gastrosteges one hundred and fifty-three to one hundred and fifty nine; urosteges twenty-one to twenty-seven, the first and from two to nine of the posterior ones usually divided; rattle very slender and delicate.

The general ground color is olive gray so thickly covered with minute brown dots as to give the animal a decidedly brownish hue. A narrow dark brown band of uniform width runs back and down from the eye just touching the upper angles of the eighth and ninth labials without involving them. The scales below this band are vinaceous cream. There are two small seal brown spots on the occiput. The genials and gulars are yellow tinged with vinaceous laterally. The rest of the head is unicolor. Along each side of the back is a series of from fifty-four to sixty small brown blotches. Anteriorly these have a tendency to alternate, but posteriorly they unite with one another to form crossbars. There are seven similar brown bars on the tail. The dorsal blotches are seal brown, palest centrally, and are edged with very pale brown or white. They are about one and one-half scales long, and

from two to three rows of scales wide. They are separated from the other blotches on the same side of the back by about one and one-half scales, and from those of the opposite side by the width of one scale. There are two or three rows of smaller alternating brown spots on the sides. The gastrosteges, except anteriorly, are dark slate. The edges of the gastrosteges and of the scales of the first row are whitish. The tip of the tail is bright salmon or flesh color.

	mm.	mm.	mm.
Length to rattle	447	348	341
Length of tail	41	29	32
Segments in rattle	7 +	6	3 +

One of the five specimens has ten supralabials on one side of the head.

Habitat.—The Huachuca Mountains, southeastern Arizona. Museum of the Leland Stanford University, Palo Alto, California. W. W. Price, collector.

This interesting species has relationships with both the *C. tigris* and the *C. lepidus*, judging from the description. It seems to be quite distinct from both in the small number of labial plates and the number and size of the dorsal spots. The urosteges are more than usually divided.

CROTALUS HORRIDUS Linnæus.

Crotalus horridus LINNÆUS, Syst. Nat. Ed., XII, I, 1766, p. 372 [Primó. cit. Mus. Ad. Fr., I, 39, ubi "Frons tecta squamis obtusissimis, palpebræ superiores planæ magnæ" legatur. Porro, Catesby Carol. Hist. (A) et Amœnitat. Acad. (B) citantur. (A. "*Vipera caudisona americana*," et "*V. c. a. minor*" describuntur, pp. 41, 42; sed "*V. c. a. minor* caput scutis magnis instructum habet."¹) (B. In. Amœn. Acad., II, p. 139. *C. durissa* (hujus enumerationis) (Amœn. Acad., I, 500) citatur! et "*Virginianis rattlesnake*" denominatur!) Secundo cit. Seba, 95, f. l., ubi *C. terrifica* delineatur!!]—SHAW, Gen. Zool., III, 1802, p. 317.—CUVIER, Règne Animal, II, 1817, p. 78.—GRAY, Synopsis Rept., 1830, p. 78.—GUÉRIN, Iconogr. R. Anim., 1830, pl. XXIII, fig. 2.—GRIFFITH, Cuv. Règne Animal, IX, 1831, p. 267.—LE CONTE, Proc. Acad. Nat. Sci. Phila., VI, 1853, p. 417.—COPE, Proc. Acad. Nat. Sci. Phila., 1859, p. 338; Check-list N. Amer. Batr. Rept., 1875, p. 33.

Crotalus durissus LATREILLE, Hist. Rept., III, 1801, p. 190.—DAUDIN, Hist. Rept., V, 1802, p. 304 (exclus. cit. Linnæus, Laurenti, Lacépède).—HARLAN, Journ. Acad. Nat. Sci. Phila., p. 368 (exclus. cit. Linnæus and Laurenti); Med. et Phys. Res., 1825, p. 132.—SCHLEGEL, Essai sur le Phys. Serp., II, 1837, p. 365 (exclus. descrip. color., p. 366, and homonyms, *Uropsochus triseriatus* Wagler and *Crotalus confluentus* Say).—STORER, Report Rept. Mass., 1839, p. 233.—HOLBROOK, N. Amer. Herp., III, 1842, p. 9 (exclus. cit. Linnæus).—DE KAY, Zoology of N. Y., Pt. 3, 1842, p. 55 (exclus. cit. Linnæus, Say).—LE CONTE, Southern Med. and Surg. Journ., 1853, p. 663.—BAIRD and GIRARD, Cat. N. Amer. Rept., Pt. 1, Serp., 1853, p. 9 (exclus. cit. Linnæus).—BAIRD, Serpents of N. Y., 1845, p. 9 (exclus. cit. Linnæus).—DUMÉRIL and BIBRON, Erp. Gén., VII, 1854, p. 1465 (exclus. cit. Linnæus Latreille, and Wagler).—BAIRD, U. S. Pac. R. R. Expl. Surv., X, Whipple's Rept. Reptiles, 1859, p. 39 (exclus. cit. Linnæus).—† JAN Rev. et Mag. de Zool., 1859, p. 153.

Crotalus atricaudatus LATREILLE, Hist. Rept., III, 1801, p. 209.—† BOIE, Isis von Oken, 1827, p. 562.—WAGLER, Nat. Syst. Amphib., 1830, p. 177.—GRAY, Zool. Miscell., 1842, p. 51.

Urocrotalon durissus FITZINGER, Syst. Rept., 1843, p. 29.

¹ Linnæus Syst. Nat., in *C. miliaris* diagnosi.

Uropsophus durissus GRAY, Cat. Brit. Mus., 1849, p. 19 (exclus. cit. Linnæus and homonyms *confluentus* Say, *rhombifer* Latreille, *triseriatus* Wiegmann, Wagler. and Gray).

? *Crotalus catesbei* Hemprich, FITZINGER, Neue Class., p. 63, according to Gray

? *Urocrotalon catesbyanum* Fitzinger, DIESING, Syst. Helminth., II, 1851, p. 431.

Figures, CATESBY, Hist. Car., II, pl. XLII.—LACÉPÈDE, Serp., II, pl. XVIII, fig. 3.—SHAW, Zool., III, pl. LXXXVIII.—DAUDIN, Hist. Rept., V, pl. LXVIII.—GUÉRIN, Iconogr. R. Animal, pl. XXIII, fig. 2.—SCHLEGEL, Essai, pl. XX, figs. 15, 16; Dict. Univ. Hist. Nat. Atlas, II, pl. XIII, fig. 7.—DUMÉRIL and BIBRON, Erp. Gén. Atlas, pl. LXXXIV bis, fig. 7.—HOLBROOK, N. Am. Herp., III, pl. I.—DE KAY, Zool. New York, Pt. 3, Atlas, fig. 19.—BAIRD, Serp. N. Y., pl. I, fig. 1; U. S. Pac. R. R. Expl. Rept., X, Reptiles, pl. XXIV, fig. 1.

Habitat.—Eastern United States to the Plains.

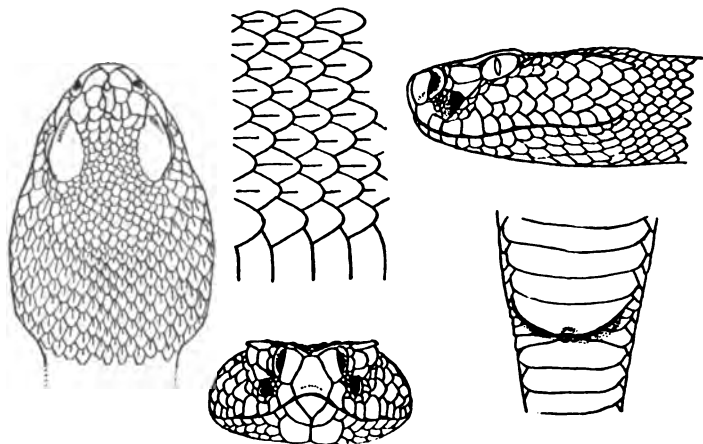


Fig. 342.

CROTALUS HORRIDUS LINNÆUS.

= 1.

Kansas.

Cat. No. 4691, U.S.N.M.

Upon the top of the extremity of the muzzle there are two subtriangular shields (internasals) in contact with each other. A large oval shield covers the region over each eye (superciliary). These shields are in contact anteriorly with the prefrontal, and forms upon each side the external shield of a cross series (postfrontals) immediately behind the prefrontals, which is usually composed of five plates. The remaining part of the upper surface of the head is covered with small subtuberculous scales.

The shields bounding the upper lip (superior labials) are from twelve to fourteen in number, the fourth or fifth the largest; those bounding the lower lip (inferior labials) thirteen to fifteen. Three rows of scales separate the eye from the superior labials. Two plates in front of the eye (preoculars), the lower usually reaching the pit in the side of the face; the upper larger and separated from the hinder of the two plates, between which the nostril is pierced (nasals) by two or more small plates (lores). The scales of the body are in twenty-three or twenty-

five longitudinal rows, all keeled, the two rows on each side next the shields of the abdomen (gastrosteges) faintly.

The ground color above varies from bright yellowish tawny or fulvous to dark brown; beneath from whitish yellow to black gray. A light line extends from the superciliary plate to the angle of the mouth, behind which is a dark band or blotch. Upon each side of the medial dorsal line there are two series of brown or black spots. The spots of the upper or medial series are larger, rhomboid, running obliquely upward and backward. They are frequently confluent across the middle line of the back anteriorly; always upon the posterior half of the body. The spots of the lower series encroach slightly upon the gastrosteges, and posteriorly unite with those of the middle series to form zigzag cross bands. Anteriorly they sometimes alternate with the central series, or rather become confluent with an indefinite alternating series, and joining the extremities of the former inclose the ground color, which thus forms a series of light spots. Of these transverse bands or rows of spots there are twenty-one, more or less, from the head to the anus. In Southwestern specimens a narrow rufous band frequently extends along the median dorsal line throughout the whole length. Tail nearly always entirely black.

This species is found from Maine to Kansas and from Louisiana to Florida.

Cat. Nos.	Scales.	Upper labials.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.	Rattle. mm.
244	25.	13.	168 + 1.	24.	1,318.	115.	15.
245	23.		166 + 1.	25.			
246	23.		168 + 1.	18.			
247	23.		165 + 1.	25.			
1299	25.		165.	25.			
9320 (no rattle)	25.	14.	178.	25.	1,220.	100.	

The largest individual of this species which I have seen is from near Fort Macon, North Carolina. Its length is 5 feet and its diameter that of the full sleeve of an ordinary house coat.

This species has the widest range of all the species excepting the tropical *C. durissus*. It was formerly abundant in the eastern district everywhere, but it has been exterminated from the well-settled regions and is only abundant in the wilder regions. It is not uncommon about Lake George in northern New York and in the Berkshire Hills in western Massachusetts. Thence it is to be found throughout the Alleghany Mountains to Georgia and Alabama. I have not seen a specimen from Florida.

Crotalus horridus Linnaeus.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
8372	1	Wilmington, North Carolina.		Dr. A. Reuss	Alcoholic.
248	1	St. Simons Island, Georgia.		J. P. Fox	do.
4621	1	Kansas	— —, 1858	Capt. J. H. Simpson, U. S. A.	do.
4394	1	Arkansas		Colonel Kearney	do.
249	1	Iowa		B. F. Odell	do.
276	1	Brazos River, Texas		Dr. B. F. Shumard	do.
1292	1	Carlisle, Pennsylvania		Prof. S. F. Baird	do.
244	1	West Virginia		Dr. P. R. Hoy	do.
9820	1	Wilmington, North Carolina.		Dr. P. R. Hoy	do.
9973	1	Katonah, New York	Aug. 26, 1878	J. D. Miller	Alcoholic-cast.
1299	1	Prairie Mer Rouge, Louisiana.		J. Fairie	Alcoholic.
273	1	San Bois, Choctaw Hillsboro, Virginia			do.
14755		Hillsboro, Virginia		G. W. Shutt	do.
14840		Deer Park, Maryland		Chas. Hobbs	do.
17959		Laughlinstown, Pennsylvania.		O. P. Hay	do.
19970		Rappahannock County, Virginia.		Albert E. McConnell	do.
20651-2		Portland, Connecticut		Jno. H. Sage	do.
20955		Greensboro, Hale County, Alabama.		Dr. W. C. Avery	do.
22275		Lycoming County, Pennsylvania.		Nat. Zool. Park	do.
22675		do		do	do.
22728		do		do	do.

Prof. O. P. Hay¹ gives the following account of the habits of *Crotalus horridus*:

In its free state this species appears to inhabit wooded districts, although it may probably sometimes be found on the prairies. It especially delights in taking up its abode where there are rocks and debris, among which it can find at short notice a safe retreat. Its movements of locomotion are rather slow. When surprised, it will often seek to escape without inflicting injury on its enemy. When, however, it is pressed, or there is no time for retreat, it delivers a blow with such rapidity that the motion can hardly be followed.

Rattlesnakes do not appear to try to injure one another by biting. Indeed, Dr. Mitchell states that the poison does not affect the snakes themselves. He says that he has over and over injected under the skin of a rattlesnake its own venom or that of a moccasin, or of another rattlesnake, but he had in no case seen a death. He often kept from ten to thirty-five rattlesnakes together without any of them harming the others. If a large snake were suddenly dropped on the others they would show no resentment, whereas if any other animal were thus dropped on them it would immediately get a blow. In captivity they are extremely sluggish, not moving, and for long periods refusing to accept food. Usually, after about a year without food, they will kill and eat animals. Dr. Mitchell fed his numerous specimens by putting a long funnel down their throats and pushing the food into their stomachs. They were very fond of water, and would drink large quantities of it and lie in it for hours.

They shed their skins at different times. If they did not have water, the skin would come off in patches. He says nothing about the relation of the shedding of the skin and the acquisition of new segments of the rattle. It has been noted by observers that a variable number of segments of the rattle is acquired each year, although the popular idea is that one is the number. As high as four have been observed to be added in a single year. The terminal segments, too, are constantly

¹ The Batrachians and Reptiles of Indiana. Indianapolis, 1893, p. 129.

being worn off, so that the number of segments present is no indication of the age of the snake.

Holbrook states that Mr. Peale, of the Philadelphia Museum, kept a living female rattlesnake for fourteen years. She had eleven rattles when she came into his possession. Several were lost annually and new ones formed. When she died, there were still eleven. During this period the snake had grown 4 inches in length.

The number of young appears to be about nine. I found this number of eggs in a female about 37 inches long, brought from Pennsylvania. The eggs were 1.5 inches long by an inch in diameter. Of these there were four in the left oviduct. There were evidences that development had begun.

Where these snakes are numerous, they are inclined to gather in considerable numbers in caverns in rocks and similar places in order to undergo their winter sleep. Such places form the rattlesnake dens about which we hear occasionally.

CROTALUS ENYO Cope.

Crotalus enyo COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 293.—COPE, Check-list N. Amer. Batr. and Rept., 1875, p. 33.—VAN DENBURGH, Proc. Cal. Acad. Sci., 1895, p. 157.

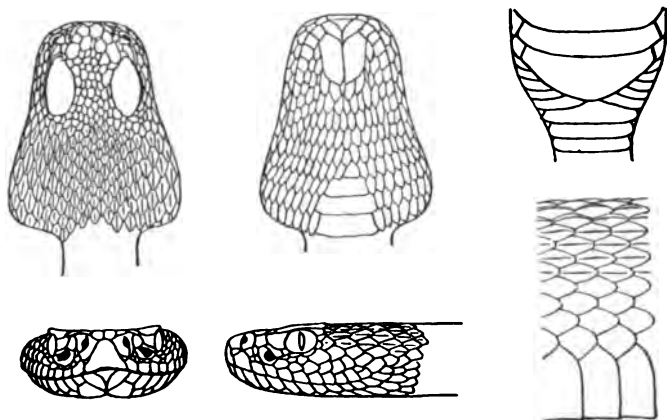


Fig. 343.

CROTALUS ENYO COPE.

= 1.

Cape St. Lucas, Lower California.

Head depressed, covered with small keeled scales. Superciliaries large, prominent, preceded by a small marginal plate; muzzle covered above with nearly equal polygonal scales, slightly or not keeled. Rostral plate low, in form a nearly equilateral triangle; nasals two, the anterior in contact with the rostral; numerous small scales anterior to the pit. Thirteen or fourteen superior labials, the posterior small; fourteen and fifteen inferior, the second, third, and fourth in contact with the genae. Two rows of smooth scales and the infraorbital circle separate the labials from the orbit; the scales of the former continue smooth upon the temporal region, and are larger than the labials. Scales of the body rounded, short upon the sides, especially those of the first three rows, which, near the middle of the body, are not at all, or scarcely,

keeled. Total number of rows twenty-three, the median very strongly keeled, none rugose striate as in *C. adamanteus atrox*. Crepitaculum moderate, its segments diminishing in breadth toward its extremity. Gastrosteges, one hundred and sixty-six. Urosteges, twenty-three single, three pair double.

Measurements.—Total length (including crepitaculum), 29 inches 9 lines; tail, 4 inches 3 lines.

General color above light grayish brown, shaded with yellow; vertex rugous, marked with a pair of small brown spots. A light band bordered with dark crosses each superciliary plate; from the inner border of the same plate begins a chestnut brown band, which diverges from its fellow on the posterior part of the head, where it is either interrupted or continuous with a broader one which nearly joins that of the opposite side on the neck; here they are either interrupted, or continuing, unite on the neck, and form the first spot. A brown band extends from the eye to the canthus oris, involving the last labial plate, and is continued beyond, forming a spot on each side the throat. A series of about thirty-three spots are longer than broad, emarginate anteriorly and posteriorly; opposite to each is a black spot upon scales of the first, second, and third rows. The dorsal spots become broader, resembling transverse rhombs, with light borders outside the black; the lateral angles become confluent with the lateral black spots, forming vertical black bands on the sides. They finally assume the form of transverse brown bands. The tail is crossed by five of these, upon a brown ground. Beneath yellow; tips of many of the gastrosteges blackish. Inhabits Lower California, whence specimens have been sent to the Philadelphia Academy and Smithsonian Institution by Mr. John Xantus. Type 4663. Xantus collection.

This species bears considerable resemblance to *C. molossus* in its style of coloration, and, like it, is a beautiful animal. The latter species is scutellated upon the muzzle, as in *C. durissus*, the rows of scales are more numerous than in *C. enyo*, and it is without the head stripes.

Cat. Nos.	Scales.	Upper labials.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.	Rattling ms.
5291.....	25.	13.	162.	26.			
12623.....	25.	14.	170.	20.	744.	86.	41

Crotalus enyo Cope.

Catalogue No.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
5291	3	Cape St. Lucas, L. California.	.....	J. Xantus	Alcoholic
12623	1	La Paz, L. California.....	Feb. —, 1882	L. Belding.....	do.

This species does not appear to range to the north of the Cape St. Lucas zoological district. Mr. Van Denburgh records six specimens from San José del Cabo.

CROTALUS LEPIDUS Kennicott.

Crotalus lepidus KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1861, p. 206.—COPE, Proc. Acad. Nat. Sci. Phila., 1883, p. 13.

Aplouspis lepida COPE, Report U. S. Geog. Surv. W. of 100th Mer., 1875, p. 535.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 33.

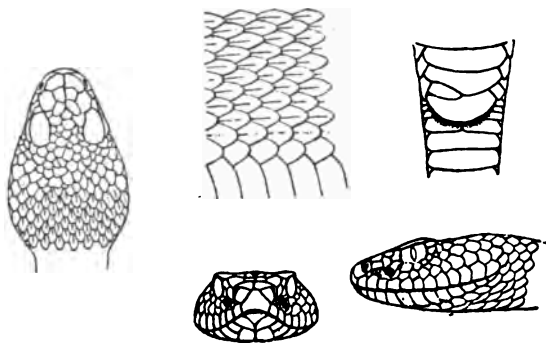


Fig. 344.

CROTALUS LEPIDUS KENNICOTT.

= 1.

Rio Grande, Texas.

Head ovoid, tapering to the nose, which is narrow, pointed, and depressed. Nostril small, circular, and placed near the point of the nose in about the middle of a nasal plate, which is usually only divided from the nostril downward. Two elongated internasals in contact, extending behind the nostrils. Superciliaries and other large plates smooth. Rostral subtriangular, broader than high, the apex turned back slightly upon the crown. Upper preorbital small and separated from the postnasal by the width of two larger loreal plates. Labials rather large, twelve above, ten to twelve below. Color of head yellowish ash.

The head is much depressed, the general outline ovoid, tapering regularly from about opposite the angle of the mouth to the nose. The crown is remarkably smooth and the occipital scales are very faintly carinated. There are two large internasals elongated laterally and posteriorly, with their inner ends in contact. They are convex on their external and concave on their internal edges, and extend for nearly half their length back of the nostril. Behind and fitting into the emargination formed by these are two subquadrangular and smaller plates in contact. Immediately behind these is another similar pair. On each side of these last two pairs, at the edge of the crown, between the superciliaries and anterior frontals, is a larger plate. The superciliaries are rather small, and, like the other larger plates, quite smooth; the space between the superciliaries is quite narrow and filled with three rows of irregular large scales; the posterior part of the crown is also covered with rather large and smooth scales. The lower preorbital

is, as usual, small and elongated over the pit, but the upper, very small and quadrangular, is separated from the nasal by two plates, each larger than itself. In all the other species the upper preorbital is large, more or less elongated, and in contact with the postnasal or only separated from it by the width of one smaller plate. The suborbital chain is complete, and there is only a single row of scales between that and the labials. The color of the head is uniform yellowish or light brownish ash without any distinct spots or stripes, though each plate is minutely mottled with brownish and with a few scattering black dots, and there is a very faint indication of the usual posterior facial stripe extending over the angle of the mouth.

It will be at once distinguished from *C. tigris* by the single nasal, number of loreals, number and comparative size of labials, and number of rows between the suborbitals and labials, and by the narrow, pointed nose instead of the broad, blunt snout of *C. tigris*. It disagrees also with *C. c. lucifer* in all of the above characters excepting the size of labials and the narrow nose, and differs widely from that species in the depressed snout, wide rostral, and perfectly smooth plates and scales on the head. By the smoothness and size of the plates and absence of the horn it will be at once distinguished from *C. cerastes*. It will be impossible to confound it with any of the Eastern species.

The color above is a greenish gray, which is crossed by nineteen jet-black rings on the body, which do not extend on the abdomen. These rings are two and a half scales wide on the middle line and narrow downward on each side, so as to cover but one scale in width. The scales which border the annuli are half black and half green, the effect of which is to give the edge of the ring a turreted outline. The edges of the ground color are paler than any other part of the scales, thus throwing the black into greater relief. A large black spot, shaped like two hearts side by side, with the apices posterior, marks the nape, and there is an irregular small black spot on each side of the occiput; some black specks between the orbits; no other marks on the head. Near the middle of the gray spaces of the body some of the scales of many of the rows have black tips. The tail is light brown above and has a basal broad black and two other narrow brown annuli. Below dirty white, with closely placed shades of brown.

The following specimen is in the museum of the University of Kansas, and is from the Magdalena Mountains, New Mexico. It furnishes the following data: Rows of scales, 23; upper labials, 12; gastrosteges, 153; urosteges, 27; total length, 555 mm.; rattle, 74 mm.

In the typical specimens the nasal plates are not divided. In three specimens since received the plates are separated from the nostril downward. In two specimens the cross-bands are uninterrupted. On two others (from Fort Huachuca, Arizona) the bands are broken at the ends on the sides, along the middle of the length, giving rise to a row of lateral spots. In both the tail is salmon color, with two dark cross bands.

Crotalus lepidus Kennicott.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
.....	1	Presidio del Norte, Texas.....	.....	Head, alcoholic.
.....	1	Eagle Pass, Texas.....	.....	do.
21106	1	Fort Huachuca, Arizona.....	Dr. Wilcox, U. S. A.....	Alcoholic.
19672	1	do.....	do.....	do.

This is a peculiarly handsome species and is the only one to which the term "green rattlesnake" can be correctly applied. In the arrangement of its dark colors it approaches nearer to the *C. horridus* of the East than any other form. In the arrangement of its head scales it approaches the *C. polystictus*.

CROTALUS MITCHELLII Cope.

Crotalus mitchelli COPE, Wheeler's Rep. Surv. W. 100th Mer., V (1875), p. 535; Proc. U. S. Nat. Mus., XIV, 1892, p. 689.—VAN DENBURGH, Proc. Cal. Acad. Sci. (2), IV, 1894, p. 450.—STEJNEGER, Rept. U. S. Nat. Mus. for 1893 (1895), p. 454, pl. xvii.

Caudisona mitchelli COPE, Proc. Acad. Nat. Sci. Phila., 1861, p. 293; 1866, p. 310.

Caudisona pyrrha COPE, Proc. Acad. Nat. Sci. Phila., 1866, p. 308.

Crotalus pyrrhus COPE, Wheeler's Rep., p. 535, pl. xxii; Proc. U. S. Nat. Mus., XIV, 1892, p. 689.—STEJNEGER, W. Amer. Scient., VII, 1891, p. 165.

Crotalus confluentus var. *pyrrhus* GARMAN, N. Am. Rept., 1883, p. 173.

Crotalus oregonensis var. *mitchelli* GARMAN, N. Am. Rept., 1883, p. 173.

Crotalus mitchelli BOULENGER, Cat. Snakes in Brit. Mus., III, 1896, p. 580.

In this species the subdivision of the head scales is carried further than in any other. The rostral is separated from the nasal by one or two series of scales, and there are from two to five loreals, the posterior two representing the anterior parts of the preoculars of other species. There is no distinct canthus rostralis, and the scales of its external border are identical in character with those that separate them on the median part of the muzzle and front. All of these scales are rather small and are striate. Six to eight rows separate the superciliaries. The latter have a strongly convex external border. The muzzle is short and wide, and the nostrils are somewhat vertical in position. Three rows of scales separate the orbit from the labials. Superior and inferior labials both fifteen, the first inferior divided transversely, so that the postsymphiseal part is a separate element. The symphiseals taken together cordiform; rostral a triangle, a little wider than high. The scales of the body are in twenty-three to twenty-five rows and are rather obtuse. They differ little in size, except that the median five or six rows are narrower. All are rather weakly keeled except the two exterior. They are in addition finely striate ridged toward the base. The rattle of the type specimen displays eight joints and a button.

The color above and below is grayish yellow. The upper surface of the head is shaded, that of the body coarsely and densely punctulated with brown. The irregular aggregation and deepness of these punctu-

latus form a series of about forty-two dorsal spots. These are transverse, with produced lateral angles, extending across twelve rows of scales from angle to angle, separated from the adjacent ones by a bright band of ground color one and a half scales wide. On the posterior fourth of the total length they form brown cross bands. Five upon the tail are black on very light ground, as in *C. a. atrox*. Anteriorly there is an ill-defined series of spots, which are opposite those of the dorsal line. A yellow band extends from the nasal plates anterior to the eye, involving from the ninth to the last superior labial. Superior to this is a brown band extending from the eye and ceasing on a line with the angle of the mouth. Some indistinct brown marks on the top of the head are arranged as follows: One on the inner border of each superciliary; three posterior to these, the median short and broad; four further posterior, the median pair longer, diverging, reaching the neck.

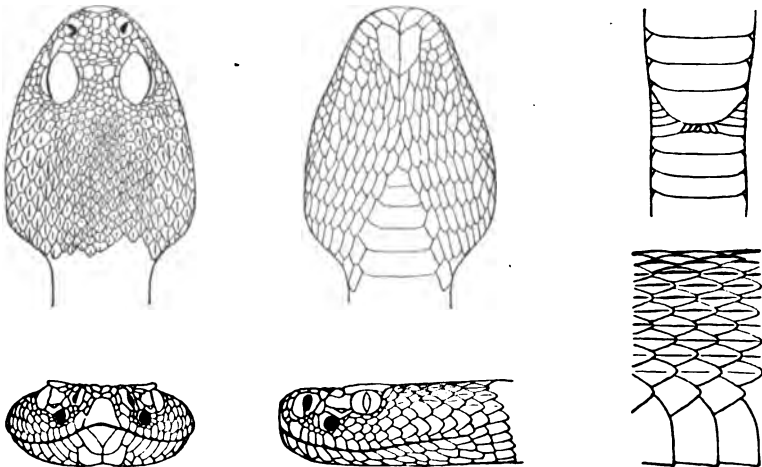


Fig. 345.

CROTALUS MITCHELLII COPE.

= 1.

La Paz, Lower California.

Cat. No. 12625, U.S.N.M.

The typical specimen from which this species was described was taken at Cape St. Lucas. A specimen from Arizona which subsequently came to hand differed so widely in squamation and color that I referred it to a distinct species under the name of *C. pyrrhus*. Thus, while the Cape St. Lucas specimen had two loreals, the Arizona animal had four, and while the Cape St. Lucas snake was pale gray, with scarcely discernible dorsal spots, the Arizonian was red, with dark-red quadrate dorsal spots. Dr. Stejneger subsequently observed that specimens from California, in about the latitude of the Arizonian locality, had the color of the Cape St. Lucas specimen, and that the number of loreals was not constant. Still later Mr. Van Denburgh, of the California Academy of Sciences, has shown that the number of loreal

scales, as well as of those separating the prenasal from the rostral, is very variable, so that the distinction between the two supposed species is purely individual.

Scale and plate formula of typical form:

Cat. Nos.	Scales.	Upper labials.	Gastrosteges.	Urosteges.	Length. mm.	Tail. mm.	Rattle. mm.
12625.....	25.	16.	179.	24.	891.	96.	33.
5291 $\frac{1}{2}$	25.	16.	198.	26.			

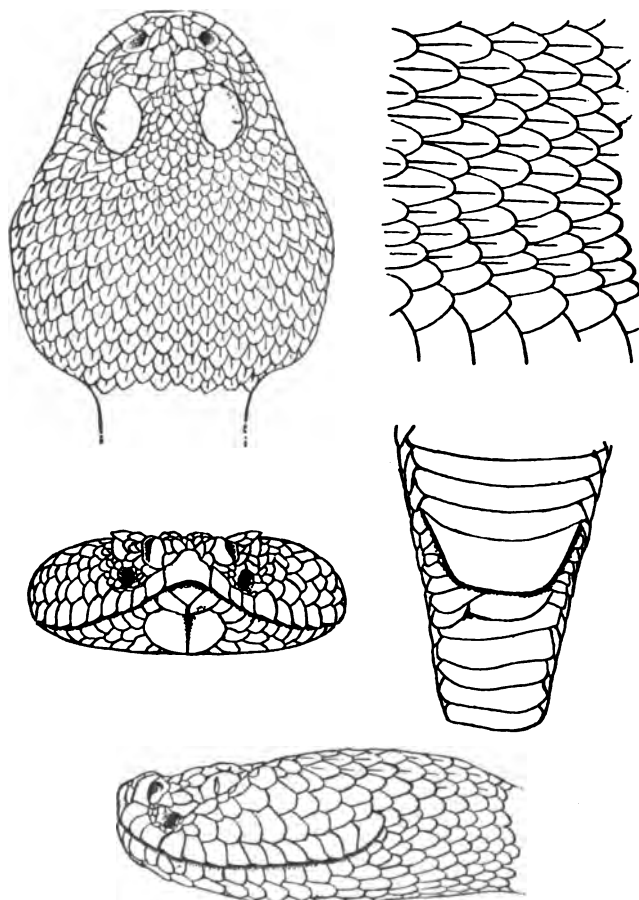


Fig. 346.

CROTALUS MITCHELLII COPE.

= 1.

Angel Island Bay, Lower California.

Cat. No. 8562, U.S.N.M.

The coloration of the type specimen of the *C. pyrrhus* is as follows:

The general tint of the specimen from which this species was described is a bright salmon red on the upper surfaces, the scales of the inferior rows punctulated with brown. This color is marked by a

row of large spots of a mahogany red, which are quadrate on the anterior part of the body, become transversely hexagonal, then lenticular, and finally form cross-bands. There are thirty-two such spots on the body, and six annuli on the tail, which are interrupted by the arosteiges below. These are of the same color as those of the back, except the last three, which are nearly black. Inferior surfaces light salmon color. The ends of the gastrosteiges are marked with alternate blotches of yellow and mahogany, each covering the extremity of one or two scuta. There are no distinct color marks on the head, but the lips are lighter. Formula:

Cat. No. 6606; rows of scales, 23; upper labials, 15; gastrosteiges, 174; urosteiges, 26; total length, 770 mm.; tail, 87 mm.; rattle, 43 mm.

This species was dedicated to Dr. S. Weir Mitchell, of Philadelphia, author of the well-known researches on the venom of the rattlesnake, the *Heloderma*, etc.

Crotalus mitchellii Cope.

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
5291	1	Cape St. Lucas, L. California.	J. Xantus	Skin in alcohol.
12625	1	La Paz, Lower California...	L. Belding	Alcoholic.
8562	1	Angel Island Bay, Lower California.	Dr. T. H. Streets, U. S. N.	do.
6606	1	Fort Whipple, Arizona	Dr. E. Coues	Skin in alcohol.
8689	1	Mohave Desert, Arizona	Dr. O. Loew	Alcoholic.
	1	Angel Island, Lower California.	C. H. Townsend	do.
	2	Colorado Desert, California.	C. R. Orcutt	do.
15978		Puerto Refugio, Island Angel de la Guardia, Gulf of California.	U. S. Fish Commission	do.
16353		Near Mount Springs, Colorado Desert, California.	C. R. Orcutt	do.
16501		Colorado Desert, San Diego County, California.	do	do.
22047-8		Mount Springs, halfway up E. slope Coast Range, San Diego County, California.	Dr. E. A. Mearns	do.
22580		Colorado Desert	C. R. Orcutt	do.

Besides the above specimens, Mr. Van Denburgh records specimens from the following localities in Lower California: In the museum of the California Academy of Sciences, Santa Margarita Island, one; Las Huevitas, one; Sierra El Taste, one; San José del Cabo, seven; total, ten specimens.

CROTALUS CERASTES Hallowell.

Crotalus cerastes HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1854, p. 95; U. S. Pac. R. R. Expl. Report, Williamson's Rep. Reptiles, 1859, p. 17.—BAIRD, U. S. and Mex. Bound. Surv. Reptiles, 1859, p. 14.—COPE, Check-list N. Amer. Batr. Rept., 1875, p. 33.—STEJNEGER, Report U. S. Nat. Mus. for 1893, 1895, p. 450, pl. xv.—BOULENGER, Cat. Snakes Brit. Mus., III, 1896, p. 583.

Crotalus (Echmophrys) cerastes COUES, Report U. S. Geog. Surv. W. of 100th Mer., 1875, p. 609.

Size small and medium. Head wide, the muzzle short and obtuse and with indistinct canthus rostralis. Rostral plate in immediate contact with the prenasal, low in form, or wider than high. Postnasal

only separated from prenasal below the nostril, and from preocular by a large loreal. Three rows of scales below orbit. Scales on top of muzzle smooth, four on each side larger than the others, two bordering the nasals above, and two smaller ones bordering the superciliary in front. Scales between superciliaries small, in five rows. Those behind them and on the cheek keeled. External border of the superciliary plate produced, sometimes considerably to an obtuse apex, which is grooved longitudinally below. Scales of the body strongly keeled, except the two inferior rows, which are smooth.

General color light yellowish or brownish gray above, dirty white below. The upper surface is crossed by a median series of transverse brown hexagons, the color marked with numerous black punctulations. Opposite the lateral apices of these, on the fourth row of scales, is a small spot of the same color, and between these, on the first and second rows, and the end of the adjacent gastrostegae is a rather larger

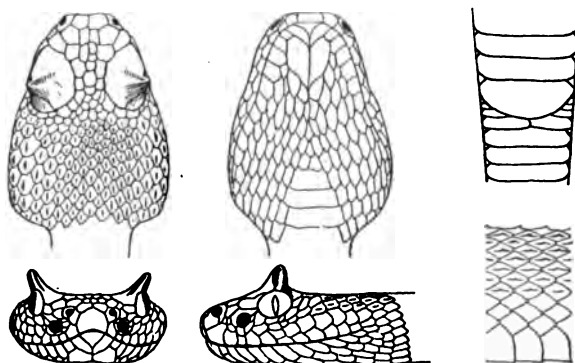


Fig. 247.

CROTALUS CERASTES HALLOWELL,
Cat. No. 15312, U.S.N.M.

dusky spot. None of these spots have dark or light borders except the median series, which are narrowly black edged anteriorly and posteriorly on the middle part. The dorsal bands increase in relative transverse diameter on the posterior part of the body, but it is only on the tail, and a part of the body of equal length anterior to it that they extend, that they are united with the lateral spots. The extremities of the gastrosteges are shaded opposite the lateral and median spots, but they are elsewhere unspotted. The head is in the specimens in alcohol without markings on the pale ground color, excepting a dusky postorbital band, which passes above the rictus of the mouth. The space anterior to it, and below the eye, as far as the maxillary fossa, is very light colored, probably yellow in life. The superior border of the postorbital band is not defined; the inferior border is marked with some small black spots.

Cat. No. 8923; rows of scales, 21; upper labials, 12; gastrosteges, 142; urosteges, 24; total length, 485 mm.; tail, 57 mm.; rattle, 15 mm.

We have but few specimens of this species, five only having come under my observation. It is nearest the *C. tigris* Kennicott, but has even fewer scales on the body, presenting the smallest number known in the genus. The labial plates are fewer, and the gastrosteges materially less numerous (28). The partial fusion of the nasal plates is also characteristic of the *C. cerastes* as of the *C. lepidus*.

A small rattlesnake has been long known to the Arizonians as the "sidewinder," from its habit of progressing sidewise instead of in the usual way. It has been ascertained by Dr. J. L. Wortman that the species which possesses this peculiarity is the *Crotalus cerastes*. During an ethnological exploration of the valley of the Salt River, a tributary of the Gila, in Arizona, he frequently observed the snake and its habits.

In his report on the results of the Death Valley expedition Dr. Merriam gives the distribution and habits of this species as follows:

The horned rattlesnake, or "sidewinder," as it is locally known throughout the region it inhabits, is the characteristic snake of the Lower Sonoran deserts of the Great Basin, from southern California easterly across southern Nevada to Arizona and southwestern Utah. It inhabits the open deserts, while its congener of the same region (*C. tigris*) lives in the desert ranges. Its local name is derived from its peculiar mode of progression. When disturbed it moves away sideways, keeping its broadside toward the observer instead of proceeding in the usual serpentine manner. Its bite is said to be fatal, which is probably not the case under ordinary circumstances. A large number were secured by the expedition, and many others were killed, but no one was bitten by it. It was found on both sides of Pilot Knob, in the Mohave Desert (April 5 and 6); in Pahrump Valley, where four were caught in a space of a mile and a half (April 28 and 29); in Vegas Valley (May 1); in Vegas Wash (May 3); in Indian Spring Valley (May 29), where one was shot containing a kangaroo rat (*Dipodomys*) and two pocket mice (*Perognathus*); in the Amargosa Desert (May 31), and in Sarcobatus Flat (June 2). It was common in the valley of the Virgin and Lower Muddy (May 6 and 7), and was said to inhabit Pahranaagat Valley, though we did not find it there.

During the latter part of April and the early part of May these rattlesnakes were often found in pairs, and were doubtless mating. At such times they remained out in plain sight over night instead of retreating to holes or shelter under desert brush, and on two occasions they were found by us on cold mornings so early that they were too chilled to move until considerably disturbed. I stepped on one of these by accident as it lay in a compact coil with its head in the center, but it was held so firmly by my weight that it was unable to strike. A moment before, I had killed its mate. I killed three on the mesa east of St. Joe, in the valley of the Muddy, in eastern Nevada, May 7.

Crotalus cerastes Hallowell.

U. S. N. M. No.	Sex and age.	Locality.	Altitude.	Date.	Collector.	Remarks.
			<i>Feet.</i>	1891.		
18648	Adult.	Pahrump Valley, Nevada		Apr. 29	Merriam	Type locality.
18647	Adult.	do .....	.....	.....do	do	
18648	Adult.	do .....	.....	.....do	do	
18649	Adult.	do .....	.....	Apr. 28	do	
18650	Adult.	Indian Spring Valley, Nevada .....	.....	May 29	Bailey	
18651	Adult.	do .....	.....	.....do	Merriam	
18652	Young	Ash Meadows (14 miles north of), Nevada.	.....	Mar. 11	Stephens.	
18653	Young	Sarcobatus Flat, Nevada	4,500	June 2	Bailey	
18654	Young	Amargosa Desert, Nevada .....	.....	May 31	Merriam	
18655	Young	Death Valley (Bennett Wells), California.	.....	Apr. 3	Bailey	
18656	Young	Mohave Desert, California .....	.....	Apr. 6	Merriam	
18657	Young	Borax Flat (water station), California.	2,200	Apr. 22	Stephens.	
18658	Adult.	Panamint Valley, California .....	.....	Apr. 24	Nelson	
18659	Adult.	do .....	.....	Apr. 23	Bailey	
18660	Adult.	Lone Pine, California .....	.....	June 7	Palmer	

Catalogue No.	Number of specimens.	Locality.	From whom received.	Nature of specimen.
482	1	Colorado River, Colorado	A. Schott	Alcoholic.
5022	1	Fort Buchanan, Arizona	Dr. B. J. D. Irwin, U. S. A.	do.
8923	1	Southern Utah	Dr. H. C. Yarrow	do.
9116	1	Cottonwood Canyon, Nevada	John Kohler	do.
15312	.....	Solado Valley, Mariposa County, near Tempe, Arizona.	Dr. J. L. Wortman	do.
15713	.....	Vulture, Arizona	L. Stejneger	do.
16953-4	.....	Salton, on S. F. R. R., Colorado Desert, San Diego County, California.	C. R. Orcutt	do.
20494	.....	Chrystoval, Yuma County, Arizona.	R. J. Young	do.
21845	.....	Yuma Desert, monument 200, Arizona.	Dr. E. A. Mearns	do.
22049	.....	Laguna Station, Colorado Desert, San Diego County, California.	do	do.
22050	.....	Coyote Wells, Colorado Desert, San Diego County, California.	do	do.

GEOGRAPHICAL DISTRIBUTION.

As is well known, the aggregates of organic beings called faunæ and floræ correspond in part with the natural land divisions of the earth's surface, but not exactly. The first classification of the primary faunæ was proposed by Dr. P. L. Sclater in 1858, as follows:

1. *Palaearctic*.—Europe, Northern Africa, Northern and Central Asia.
2. *Ethiopian*.—Africa south of the Great Desert, and Madagascar.
3. *Indian*.—Southeastern Asia and the Malay Archipelago.
4. *Australian*.—Australia with New Guinea and the adjacent islands, New Zealand, and Polynesia.
5. *Nearctic*.—North America as far south as Mexico.
6. *Neotropical*.—Central and South America and the West Indies.

Subsequently Dr. A. R. Wallace proposed that the name Oriental be used in place of Indian.

In 1868 Prof. T. H. Huxley proposed that the world's areas be arranged in two divisions, Arctogæa and Notogæa; the former including the Palearctic, Indian, Ethiopian, and Nearctic of Sclater, and the latter

including the Australian and Neotropical regions. To the last two he added the Novo-Zealandian for New Zealand, and he proposed to change the name of the Neotropical to Austrocumbian.

In 1871 Dr. J. A. Allen proposed the following faunal divisions: I. Arctic Realm; II. North Temperate Realm; III. American Tropical Realm; IV. Indo-African Tropical Realm; V. South American Temperate Realm; VI. African Temperate Realm; VII. Antarctic Realm; VIII. Australian Realm.

In 1874 Sclater modified his system as follows: He retained the term *Arctogæa* in the Huxleyan sense. To the Neotropical region he gave the name of *Dendrogæa*, and to the Australian he gave the name of *Antarctogæa*, omitting New Zealand and Polynesia, which he constituted a fourth division, *Ornithogæa*.

In 1878 Heilprin proposed the name *Holarctic* to include Sclater's Palearctic and Nearctic regions. He also proposed two transitional regions; that of the Old World he called *Mediterranean* and that of the New World the *Sonoran*, the latter a term already introduced by Cope for a division of the Nearctic of Sclater.

In 1884 Gill proposed the following primary divisions or realms: 1, *Anglogæan* (North American); 2, *Eurygæan*, or *Eurasian*; 3, *Indogæan*; 4, *Afrogæan*; 5, *Dendrogæan*, or *Tropical American*; 6, *Amphigæan*, or *Temperate South American*; 7, *Austrogæan*, or *Australian*; 8, *Ornithogæan*, or *New Zealand*; 9, *Nesogæan*, or *Polynesian*. Professor Gill justly insisted on the importance of fresh-water fishes as furnishing definitions of natural faunal realms and regions.

In 1890 Blanford published a system of geographic zoology in which he adopted the primary divisions of Huxley, and divided the *Arctogæan* region into the following: *Malagasy*, *Ethiopian*, *Oriental*, *Aquilonian* (= Palearctic and northern part of Nearctic), and *Medio-Cumbian* (southern part of Nearctic).

In 1896 Lydekker proposed the following divisions: I. *Notogæic* Realm; regions: 1, *Australian*; 2, *Polynesian*; 3, *Hawaiian*; 4, *Austromalayan*. II. *Neogæic* Realm; region, *Neotropical*. III. *Arctogæic* Realm; regions: 1, *Malagasy*; 2, *Ethiopian*; 3, *Oriental*; 4, *Holarctic*; 5, *Sonoran*. Lydekker makes use of paleontologic evidence in this connection. While this treatment of the subject is important from the point of view of origin, it is often irrelevant, since the distribution of vertebrate life in each geologic age was different from that in each other geologic age.

In an essay on the geographical distribution of North American *Reptilia* published in 1875, the present writer adopted the first system of Sclater. After a lapse of twenty years, the light thrown on the subject by various investigators suggests the following modifications: In the first place the recognition of the close similarity of the life of the northern regions of the earth, requires more definite formulation than was accorded it in Sclater's first system, by the union of his three divi-

sions of Nearctic, Palaearctic, and Indian into one, for which the name *Arctogæa* is appropriate. The inclosure of his Ethiopian division in it, as proposed by Huxley, does not seem to me to be proper, in view of the important types of fishes and reptiles which characterize it; for instance, the Crossopterygian, Dipnoan, and Scyphophorous fishes, and the Pleurodire tortoises. In the fishes, indeed, the Ethiopian region has as much affinity with the Neotropical fauna as with any other, in its Characinid and Cichlid families, and in the Dipnoan subclass. The presence of the Dipnoi and the Pleurodire tortoises allies it to the Australian fauna as well. It is for these reasons that Professor Gill proposes to combine the southern hemisphere realms into a single "Eogæan" division. The northern affinities of the Ethiopian Realm are, however, too many to permit us to regard this arrangement as a just expression of the facts. Thus, it has Insectivorous Mammalia, Firmisternial Anura, and Cyprinid fishes, none of which are Australian or Neotropical types. The course that remains under the circumstances is to regard the Ethiopian Realm as fully distinct from the other three. The definitions of the four primary divisions are then as follows:

The *Australian Realm* is peculiar in the absence of nearly all types of Mammalia, except the *Ornithodelphia* and the marsupials; in the presence of various Ratite birds, in great development of the Proteroglyph serpents, and absence of the higher division of both snakes and frogs (that is, *Solenoglypha* and *Firmisternia*); in the existence of Dipnoi (*Ceratodus*) and certain Isospondylous families of fishes. On the other hand, many of the lizards and birds are of the higher types that prevail in India and Africa, namely, the Agamidæ and the Oscines.

The *Neotropical Realm* only possesses exclusively the Platyrrhine monkeys and the great majority of the humming birds. It shares with the other southern regions the Edentate and Tapiroid mammals; Ratite, Pullastrine, and Clamatorial birds; Proteroglyph snakes; Iguanid Sauria, the Agamids being entirely absent; Arciferous frogs; and Characinid, Chromid, Osteoglossid, and Dipnoan fishes. It has but few types of the northern regions; these are a few bears, deer, and oscine birds. Insectivorous Mammalia, Viperid serpents, and Ginglymodous, Halecomorphous, and Cyprinid fishes are wanting, except on the northern border.

The *Ethiopian Realm* is that one which combines the prevalent features of the *Arctogæan Realm* with the southern hemisphere types already mentioned, together with some found elsewhere only in the Indian region, and a very few peculiar. The two latter classes not being mentioned elsewhere, they may be here enumerated. This region shares, with the Indian alone, the Catarrhine monkeys, the Elephantidæ, Rhinocerotidæ, Nomarthrous Edentata, and Chameleons. Its peculiar types are the Lemuridæ, Hippopotamidæ, and Protelidæ, Cryptoproctidæ, and Hyracoidea among mammals, and Polypteridæ and Mormyridæ among fishes. It possesses in common with the Neotropical Realm Characinid, Cichlid,

and Dipnoan fishes, Pleurodire tortoises, and Batite and Trogonoid birds; and differs from it in the absence of Arciferous Batrachia and Crotalid snakes, and presence of Dendraspid, Causid, Atractaspid, and Viperid snakes.

The *Arctogæan Realm* is characterized by the absence of types conspicuous elsewhere, and by the presence of a few peculiar forms. Among fishes it lacks Dipnoi and Crossopterygia, Osteoglossidæ, Characinidæ, and Cichlidæ. It lacks Pleurodire tortoises and Batite birds. Ginglymodous fishes and Urodele Batrachia are nearly confined to it, merely extending a little over the border of the Neotropical. Its Cryptodire tortoises extend both into the Neotropical and Ethiopian. Anguid lizards are confined to it. It shares most of its Mammalia with other regions. The Insectivora it shares with the Ethiopian, and its deer and camels with the Neotropical. The genus *Ursus* is very characteristic, one aberrant species only extending into the Neotropical.

From what has preceded it is seen that the primary differences between the faunæ of the realms are to be found to a large degree in the lower Vertebrata, the fishes, Batrachia, and Reptilia. These forms furnish stronger distinctions than the birds and mammals, owing to their greater inability to traverse natural boundaries. Neglect of these indications has led to much of the difference of opinion in the question of geographical distribution, which has been founded principally on the conditions presented by the birds and Mammalia.

In this system fragments of existing or old continents, which have been subjected to conditions unfavorable to particular forms of life otherwise prevalent in them, are, as in the system of Sclater, disregarded. Thus, islands generally are not regarded as presenting conditions definitive of divisions of the first rank, as was done by Huxley and Gill in the case of New Zealand, and Gill and Lydekker in the Polynesian Islands. The temperate regions of Africa and South America are certainly not separable from the tropical portions as divisions of primary rank, as was done by Allen, who is followed as to South America by Gill. With equal propriety western North America might be separated from Mississippi and Atlantic North America, on account of the great deficiency of its fish fauna. In estimating faunistic affinities one has to give similarities over a given area more weight than differences, where the differences are only due to absence of types.

Finally, it must be remembered that there are geographic points of transition between all the realms.

THE ARCTOGÆAN REALM.

This realm includes three regions, namely, the *Indian*, the *Holarctic*, and the *Medicolumbian*. I have already defined the first two in general terms. The third is the Transitional of Heilprin, the Sonoran of Merriam and Lydekker, and the Neotemperate of Townsend. It embraces what is left of the Nearctic of Sclater after the subtraction

of the Holarctic. As the name Sonoran has been previously given by me to one of the districts of this region, I have preferred to use for it the name given by Blanford.

The faunal characteristics of these regions may be enumerated as follows:

Indian Region.—Presence of Holostomatous fishes. Absence of Ginglymodous, Halecomorphous, and Salmonid fishes. Presence of Cæciliid Batrachia. Absence of Trachystomatous, Amphiumid, Cryptobranchid, and Arciferous Batrachia. Presence of Agamid lizards, and Angiostomatous and Viperid snakes. Presence of Phasianid, Eurylæmid, Nectariniid, and Pittid birds. Absence of Tyrannid and of several nine-quilled oscine families. Presence of Nomarthrous Edentata, of Viverridæ, Hyænidæ, Tupæiidæ, and Tarsiidæ. Presence of Rhinocerotidæ, Tapiridæ, Proboscidea, Catarrhine Quadrumana, and Anthropomorpha. Absence of Didelphyidæ, Procyonidæ, and Scalopidæ.

Holarctic Region.—Absence of Holostomatous and Halecomorphous fishes. Presence of Ginglymodous and Salmonid fishes. Absence of Trachystomatous, Amphiumid, and Cæciliid Batrachia, and absence of the Arcifera, except the family Discoglossidæ (two species of *Hyla* excepted). Absence of Angiostomatous and presence of Viperid snakes. Presence of Phasianid, and absence of Eurylæmid, Nectariniid, Pittid, and Tyrannid birds, and of several nine-quilled oscine families or subfamilies. Absence of Nomarthrous Edentata, of Viveridæ, Hyænidæ, Tupæiidæ, Rhinocerotidæ, Tapiridæ, Proboscidea, Quadrumana, and Anthropomorpha (except *Homo*).

Medicolumbian Region.—Absence of Holostomatous fishes; presence of Ginglymodous and Halecomorphous fishes. Presence of Trachystomatous, Amphiumid, Arciferous, and Firmisternal Batrachia, and absence of Cæciliidæ. Presence of Iguanid, and absence of Agamid and Chamæleonid lizards; absence (except three species) of Angiostomatous and of Viperid snakes. Absence of the Indian types of Passeres mentioned, and presence of Tyrannid Clamatores, and several groups of nine-quilled Oscines (Icteridæ, Mniotiltidæ, Tanagridæ). Absence of all the specially Indian Mammalia, and of the Holarctic Erinaceidæ, and presence of Didelphyidæ (one species), Talpidæ, and Procyonidæ.

In defining these regions I have restricted myself necessarily to types of tolerably high rank, and have not referred to species. This is because species are not generally characteristic of entire divisions, but only of parts of them. One can not, however, be absolutely exact in such major definitions, since a number of the conspicuous types in each are not universally distributed over these areas.

In comparing the Holarctic with other realms, I have already referred to the number of types which it possesses in common with the Ethiopian, not found in the Neotropical. It has also several in common

with the Neotropical, which do not occur in the Ethiopian. These are the Arciferous Batrachia, the Crotalid snakes, and the deer (Cervidæ). The Medicolumbian division of the Holarctic shares other forms with the Neotropical. These are Didelphyidæ and Procyonidæ among Mammalia; Tyrannid, Icterid, and Tanagrid birds; Cinosternid tortoises, and the Arciferous Batrachian family Hyliidæ.

Some of the forms of the Holarctic region are not uniformly distributed over it. Thus the Ginglymodous and Polyodontid fishes only occur in the eastern parts of the eastern and western continents. The same is true of the Siluroid genus *Ameiurus* and the Loricatè genus *Alligator*. The Crotalid snakes are not found in the western part of Eurasia. The Batrachian Cryptobranchidæ have the same distribution.

THE MEDICOLUMBIAN REGION.

This region was formerly included in the Nearctic of Sclater, and the area thus constituted has the following geographic boundaries: To the south it includes the plateau of Mexico, including the central valley. The Neotropical area bounds it to the east and west, occupying the lowlands, or Tierra Caliente, to a point 150 miles south of the Rio Grande on the east,¹ and to Mazatlan, or some point not far from it, on the west. The high land of Oaxaca is its extreme southern outpost. Its northern boundary is thus described by Merriam:²

The Boreal (Holarctic realm) Province extends obliquely across the entire continent from New England and Newfoundland to Alaska, conforming in direction to the trend of the northern shores of the continent. It gives off three long arms or chains of islands which reach far south along the three great mountain systems of the United States, a western arm in the Cascades and Sierra Nevada, a central arm in the Rocky Mountains, and an eastern arm in the Alleghanies, and these interdigitate with northward prolongations of the Sonoran (Medicolumbian) province, which latter completely surrounds the southern islands of the Boreal (Holarctic) system.

The faunal relations of the Medicolumbian realm may be tabulated as follows:

Agrees with Holarctic in—	Differs from Palearctic in—	
	Peculiar forms.	Neotropical forms.
Mammalia in general		Bassarididæ. Procyonidæ. Megadermatidæ.
Except	Antilocapra	Dicotyles.
	Mephitis	Didelphys.
Birds, except	Talpidae	Cathartidæ. Tanagridæ. Icteridæ.
		Clamatores in general.
		Trochilidæ.
	Meleagridæ	Odontophorinæ.
		Alligators.
		Toxid and Gerrhonotid lizards.
Emyd tortoises		Iguanid lizards.
Lachesinæ	Chelydra	Cinosternidæ.
	Crotalinæ	Elapid venomous snakes.

¹ Townsend, Texas Academy of Science, 1895, p. 87.

² Biological Survey of the San Francisco Mountain; North American Fauna, No. 3, 1890, p. 24.

Agrees with Holarctic in—	Differs from Palearctic in—	
	Peculiar forms.	Neotropical forms.
Raniform frogs.....	Plethodontidæ.....	Areifera.
Scaphiopodidæ.....	Amblystomidæ.....	Engystomidæ.
	Desmognathidæ.....	
	Trachystomata.....	
Diemictylus.....	Necturus.....	
Cryptobranchidæ.....	Amphiumidæ.....	
	Aphredoderidæ.....	
	Percopidæ.....	Siluridæ.
Percid fishes.....		
Cottidæ.....	Amblyopidæ.....	
Haplomi.....		
Acipenseridæ.....		
Polyodontidæ.....	Plagiopterina.....	
Cyprinidæ.....	Catostomidæ.....	
Gasterosteidæ.....		
Salmonidæ.....		
Petromyzon.....	Amidæ.....	

Baird¹ divided this region into three districts, which he termed the Eastern, Central, and Western. The Eastern occupied eastern North America to the central plains, where they exceed 800 feet above sea level. The Western included the territory between the Cascade and Sierra Nevada Mountains and the Pacific Ocean. In my paper of 1875² I adopted the Eastern, Central, and Western districts (calling the last the Pacific), and proposed two other districts, namely, the Austroriparian for the Louisianian division of the eastern of Verrill, and the Sonoran for the southwestern and Mexican Plateau faunæ. Merriam,³ in 1890, proposed a different arrangement. Using the name Sonoran for the entire Medicolumbian Region, he divided it into—

(1) an *Arid* or *Sonoran* subregion proper, occupying the table-land of Mexico, reaching north into western Texas, New Mexico, Arizona, and southern California; (2) a *Californian* subregion, occupying the greater part of the State of that name; (3) a *Lower Californian* subregion; (4) a *Great Basin* subregion, occupying the area between the Rocky Mountains and the Sierra Nevada, extending as far north as the plains of the Columbia; (5) a *Great Plains* subregion, occupying the plains east of the Rocky Mountains, and extending north to the plains of the Saskatchewan; and (6) a *Louisianian* or *Austroriparian* subregion, occupying the lowlands bordering the Gulf of Mexico and the Mississippi, and extending eastward south of the Alleghanies to the Atlantic seaboard where it reaches as far north as the mouth of Chesapeake Bay.

According to his arrangement the Eastern region of Baird and myself is not mentioned.

This classification may be applicable to birds and mammals; but it is not applicable to the fishes, batrachia, and reptilia, which are much more exact indicators of the histories of faunæ, owing to their inferior powers of migration. The eastern district or subregion is more nearly allied, from this point of view, to the Austroriparian than the latter is to the Sonoran proper, or arid region. This is due, as Baird previ-

¹ American Journal of Science, XCI, 1866, p. 82.

² Bulletin, U. S. National Museum, No. 1, 1875, p. 55.

³ North American Fauna, 1890, No. 3, p. 24.

ously pointed out, to the great difference in rainfall between the part of the continent lying eastward of the one-hundredth meridian and that part which lies west of it. This difference is coincident with a profound difference in geologic age between the regions west of that meridian and the eastern district, the former having a short continental history as compared with the latter.

I, however, agree with Merriam in the abolition of the "Central" as a subregion of Medicolumbia.

The relation of the several zoological divisions to these subregions are as follows: The eastern subregion is the original center of distribution of all the fishes peculiar to the Medicolumbian region, except only the Plagopterine Cyprinidæ. It is the center of distribution of all the Batrachia, with the following exceptions: The degenerate types of Trachystomata and Amphiumidæ probably originated in the Austroriparian subregion, and the species of *Bufo* in the Sonoran. The eastern subregion is also the source of the aquatic Testudinata. On the other hand the Sauria of the eastern and Austroriparian subregions are an overflow from the abundant lizard life of the Sonoran region, excepting the family of the skinks, and the genus *Anolis*, the latter being of Neotropical origin. The snakes also are mainly Sonoran types, including especially the true rattlesnakes. The copperheads and ground rattlesnakes are on the contrary indigenous to the eastern subregion. The Pacific subregion has close affinities with the Sonoran, but of a largely different kind as to its lizards, while the Batrachia have the character of the eastern types as far as they go.

The distribution of types indicates six principal subdivisions, which I call the *Floridan*, *Austroriparian*, *Eastern*, *Sonoran*, *Western*, and *Toltec* subregions. The *Floridan subregion* includes the greater part of the peninsula of Florida, being bounded approximately on the west by the Suwanee River. The *Austroriparian subregion* extends northward from the Gulf of Mexico to the isothermal of 77° F. It begins near Norfolk, Virginia, and occupies a belt along the coast, extending inland in North Carolina. It passes south of the Georgia mountains, and to the northwestward up the Mississippi Valley to the southeastern part of Illinois. West of the Mississippi the boundary crosses Missouri, extends south along the southern boundary of high lands of Texas, and reaches the Gulf at the mouth of the Rio Grande. The *Eastern subregion* is the most extended, reaching from the isothermal line of 77° F. north and from the Atlantic Ocean to the elevated plains west of the Mississippi River. Many of its forms extend up the bottoms of the rivers which flow to the eastward through the plains. The *Sonoran subregion* extends from the limit of the Eastern as far west as the Sierra Nevada, and south, including Nevada, New Mexico, Arizona, Sonora, and the Plateau of Mexico, including the State of Chihuahua, and, perhaps, Durango. It does not cross the Sierra Nevada, but includes the entire peninsula of Lower California. It extends north-

ward on the east side of the Sierra Nevada as far as, including the arid region of British Columbia. It occupies the valley of the Rio Grande, and extends into Texas as far as the Rio Pecos. It extends southward in western Mexico as far as Mazatlan. The *Western subregion* extends from the Pacific coast to the Sierra Nevada to an uncertain distance on the Lower Californian peninsula. At the north it crosses the Sierra Nevada, skips the narrow strip of the Sonoran in Washington, and extends to the Rocky Mountains, including northern Idaho and western Montana. The *Toltecian subregion* includes the States of Guanajuato, Mexico, and the adjacent elevated regions of Michoacan, Oaxaca, and Puebla, including the Alpine regions of the southern Sierra Madre. It is probable that another subregion should be added, the *Tamaulipan* of Townsend. This is a dry region extending from near the mouth of the Rio Grande to the Rio Soto la Marina, in the State of Tamaulipas. More information regarding the fauna of this country is desirable.

The faunal peculiarities of these subregions are well marked. The three subregions included in eastern North America differ from all the others in the abundance of their turtles and the small number of their lizards. Prolific of life, this area is not subdivided by any marked natural barriers. Hence, though its species present great varieties in extent of range, it is not divided into districts which are very sharply defined. The warmer regions are much richer in birds, reptiles, and insects than the cooler; and as we advance northward many species disappear, while a few others are added. The natural division of the eastern part of the continent is then in a measure dependent on the isothermal lines which traverse it, which accord also quite closely with its geologic history.

The *Floridan subregion* is distinguished by the presence of several peculiar genera of Batrachia and Reptilia, and by a number of peculiar species. A special feature is the almost total absence of Batrachia Urodela. The genera are:

BATRACHIA.

*Lithodytes.**Pseudobranchus.*

SERPENTES.

*Stilosoma.**Rhadinæa.**Seminatrix.**Liodytes.*

SAURIA.

*Rhineura.**Sphærodactylus.*

Lithodytes and *Sphærodactylus* are West Indian Neotropical genera, and *Rhadinæa*, besides being Neotropical, extends into the eastern part of the Austroriparian subregion. Five genera are then peculiar. The

peculiar species will be enumerated later. Several species of mammals are confined to this subregion. The genera of birds that do not range north of it are, according to Allen:

<i>Certhiola.</i>		<i>Aramus</i>	} Waders.
<i>Zenaida</i>	} Pigeons.	<i>Audubonia</i>	
<i>Oreopelia</i>		<i>Phænicopterus.</i>	
<i>Sternaenas</i>		<i>Haliplana</i>	} Terns.
<i>Rostrhamus</i>		<i>Anous</i>	
<i>Polyborus</i>	} Raptores.		

The isolation of the Floridan subregion is due to the fact that the nucleus of the peninsula (which is of Eocene age) was separated from the continent during the greater part of Neocene time. If at any time connected with the Antilles, the period was of short duration.

The *Austroriparian subregion* possesses many peculiar genera of reptiles not found elsewhere, while the region north of it possesses none, its genera being distributed over some or all of the remaining regions. The number of peculiar species in all departments of animal life is large. It presents the greatest development of the eastern reptile life. Sixteen genera of Reptiles and eight of Batrachia do not range to the northward, while ninety-nine species are restricted in the same manner. The peculiar genera which occur over most of its area are:

SAURIA.

Anolis.

SERPENTES.

*Elaps.**Haldea.**Cemophora.**Tantilla.**Compsosoma.**Farancia.*

TESTUDINATA.

Macrochelys.

LOBICATA.

Alligator.

BATRACHIA.

*Engystoma.**Manculus.**Amphiuma.**Siren.*

I have omitted from this list ten genera which are restricted to one or the other of its subdivisions. *Siren*, *Cemophora*, *Anolis*, and *Alligator* are the most striking of the above characteristic genera. No genus of lizards is peculiar excepting *Anolis*, which has its greatest development in other than the Nearctic continent. Among serpents a few genera of Neotropical character extend eastward along the region of the Mexican Gulf, as far as the Atlantic coast, which are not found in any of the northern regions; such are *Compsosoma* (Central American), *Tantilla*, and *Elaps* (Sonorau). On the other hand, *Abastor*, *Virginia*, *Haldea*, and *Storeria* embrace serpents which it shares with the Eastern region.

This region is the headquarters of the Batrachia, especially of the

tailed forms. The majority of species of the tailless genera are found here, especially of *Hyla* (tree toads), *Rana*, and *Chorophilus*. There are no less than nine genera of birds which do not, or only accidentally, range northward of this district. They are, according to Allen:

Plotus.
Tantalus.
Platalea.
Elanus.
Ictinia.

Conurus.
Chamaepelia.
Campephilus.
Helinaea.

All these genera, excepting the last, range into South America or further. Among mammals, but few species and one genus (*Sigmodon*) are confined to it. *Lepus aquaticus* and *L. palustris*, the cotton rat, etc., and a few others, are restricted by it. The fish fauna is very similar to that of the Eastern region.

The Eastern subregion differs from the Austroriparian almost entirely in what it lacks, and agrees with it in all those peculiarities by which it is so widely separated from the Sonoran subregion. No genus of mammals is found in it which does not range into the Austroriparian. These number from twenty to twenty-five. Among birds, the Insectivorous genera *Parascalops* and *Condylura* (star-nosed mole); but numerous species are confined to it, not extending into the Austroriparian. The following genera are, according to J. A. Allen, shared with the more southern region only: *Quiscalus*, *Siurus*, *Helmitherus*, *Protonotaria*, *Parula*, *Mniotilta*. No genus of Reptiles, and but one of Batrachians (*Gyrinophilus*), is confined to this region; but it shares all it possesses with the Austroriparian. It has but four genera of lizards, namely, *Sceloporus*, *Cnemidophorus*, *Liolepisma*, and *Eumeces*.

The Sonoran subregion is characterized in the lower vertebrate fauna by great poverty in fishes, batrachians, and tortoises, and abundance of lizards and snakes. Among fishes it lacks the orders Ginglymodi, Halecomorphi, and Chondrostei, and possesses only one peculiar group, the Plagopterinæ, a division of the Cyprinidæ. Of usual Holarctic types it possesses only Isospondyli (Salmonidæ) and Plectospondyli; Percomorphi and Nematognathi being absent. The rivers that intersect its central district contain these types, but they must be reckoned as belonging with their bottom lands to the Eastern subregion; the high plains only belonging to the Colorado. The true drainage area of the Sonoran subregion is that of the Colorado.

No genus of Batrachia is peculiar to it, and the following divisions are wanting: Proteida, Trachystomata, Amphiumoidea, and all Urodela, except Amblystomida (one species). The genus *Bufo* is the only one that is well represented.

The following genera of reptiles are peculiar to it:

<i>Uta.</i>	<i>Anota.</i>
<i>Uma.</i>	<i>Lichanura.</i>
<i>Sauromalus.</i>	<i>Phyllorhynchus.</i>
<i>Callisaurus.</i>	<i>Chionactis.</i>
<i>Dipsosaurus.</i>	<i>Chilomeniscus.</i>

It shares the following genera with the Toltecan subregion and the Central American subregion of the Neotropical Realm only:

Otenosaura.
Eublepharis (also in the Indian region).
Phyllodactylus (also in the Columbian Neotropical).
Heloderma.
Hypsiglena.
Salvadora.
Rhinechis (also Holarctic of Eurasia).
Chionactis.
Trimorphodon.
Tantilla (also in Brazilian Neotropical).
Cinosternum (also in Brazilian Neotropical).

The following genera of the Sonoran subregion enter the Texan district of the Austroriparian subregion:

<i>Holbrookia.</i>	<i>Hypsiglena.</i>
<i>Crotaphytus.</i>	<i>Rhinochilus.</i>
<i>Phrynosoma.</i>	<i>Cinosternum.</i>
<i>Gerrhonotus.</i>	

Many species are peculiar to this subregion, as will be shown later on.

The *Western subregion* is distinguished by the absence of most of the types of fishes of the humid part of the continent, and the presence of a few. Thus, the Ginglymodi, Halecomorphi, and Ostostomidae are absent, while Percomorphi are present. The Batrachian fauna lacks the Proteida, Trachystomata, and Amphiumoidea, while Urodela are abundant, excepting Cryptobranchidae. All the families of Salientia characteristic of Medicolumbia are present except the Engystomidae. Among reptiles the genus *Charina* is entirely characteristic, and *Gerrhonotus* of the Toltecan and Sonoran fauna ranges its entire length. It is especially distinguished by the absence of the following genera: First, all of the Iguanidae exclusively characteristic of the Sonoran fauna, there remaining only *Crotaphytus*, *Sceloporus*, and *Phrynosoma*, which also enter the Texan district of the Austroriparian; by the absence of *Heloderma*, *Ophisaurus*, and *Liolepisma*. Among snakes, by the absence of true water snakes (genus *Natrix*), and the small burrowing Natricinae of Opisthoglyph forms, and of poisonous snakes of the genera *Elaps* and *Sistrurus*. No genus but *Charina* can be cited as of universal distribution, which is not at the same time found in some other subre-

gion; but several genera occur in one or the other of its districts which do not occur elsewhere. Similarly, no genus of birds or mammals can be exclusively assigned to its entire area; but *Chamaea* of the former class and *Haplodontia* of the latter are restricted to particular portions of it.

The *Toltecan subregion* is characterized by the genera it lacks as well as those which it possesses. Thus, it lacks all the genera of Sauria above cited as characteristic of the Sonoran subregion, including those enumerated as passing over into the Austroriparian except *Phrynosoma*. It also lacks the following genera of snakes which are found in the Sonoran:

Lichanura.
Pityophis.
Ophibolus.

Chilomeniscus.
Zamenis,
Phyllorhynchus.

From the Austroriparian subregion it differs in the lack of all the numerous genera of fishes and Batrachia Urodela, which characterize it, excepting only *Spelerpes*. It lacks also the following genera of snakes: *Cyclpphis*, *Virginia*, *Haldea*, and *Carphophiops*; and *Natrix* is very sparsely if at all represented.

In its positive characters the Toltecan subregion combines certain forms of both the Sonoran and Austroriparian subregions. Of the former character are *Spea*, *Phrynosoma*, *Barissia*, *Gerrhonatus*, *Hypsigena*, and *Salvadora*; of the latter kind, *Spelerpes*, *Liolepisma*, *Osceola*, *Storeria*, and *Sistrurus*. Characteristic of Medicolumbia generally: *Amblystoma*, *Rana*, *Sceloporus*, *Eumeces*, *Diadophis*, *Eutamia*, *Orotalus*. Peculiar genera.

Siredon.
Thorius.
Malachylodes.

Conopsis.
Epiglottophis.
Ophryacus.

Neotropical genera: *Ædipus*, *Anolis*, *Celestus*, *Atractus*, *Ninia*, *Drymobius*, *Bothriechis*.

I. THE EASTERN SUBREGION.

The fauna of Batrachia and Reptilia of this subregion is characterized by what it lacks as much as by what it possesses. The number of species which occupy its entire extent exclusively of other subregions is small, while a larger number are restricted to parts of it. Verrill divided it into four districts, namely, the *Carolinian*, the *Alleghenian*, the *Canadian*, and the *Hudsonian*. These are distinguished by the ranges of mammals and reptiles, and the breeding-places of birds. The *Carolinian* fauna extends in a belt north of the Austroriparian subregion from Long Island, south of the hill region of New Jersey, to the southeastern corner of Pennsylvania, and thence inland. It embraces a wide belt in Maryland and Virginia, and all of central North Carolina, and then narrows very much in passing round south of the Alleghenies

of Georgia. It extends north again, occupying East Tennessee, West Virginia, Kentucky, Indiana, the greater parts of Illinois and Ohio, and the southern border of Michigan. It includes southern Wisconsin and Minnesota, all of Iowa, and the greater part of Missouri. The *Alleghenian* embraces the States north of the line just described, excepting the regions pertaining to the *Canadian* fauna, which I now describe. This includes northern Maine, New Hampshire, and Vermont, with the Green Mountains, the Adirondacks, and summits of the Allegheny Mountains as far as Georgia. It includes Canada east and north of the lakes. The *Hudsonian* fauna is entirely north of the isothermal of 50°. It has great extent west of Hudson Bay and is narrowed southeastward to Newfoundland.

The information as to the distribution of the Batrachia and Reptilia now at hand, points to the following conclusions: The Hudsonian fauna need not be further referred to here, as it is part of the Holarctic region. The Canadian is sustained, as defined by the range of certain Batrachia. The demarkation between the Alleghenian and Carolinian is determined by the northern limit of most of the species common to the Eastern and Austroriparian subregions. An important division is indicated by the boundaries set to the range of certain species by the Allegheny Mountains. This division affects chiefly the Carolinian district of Verrill, and I therefore propose to abolish that name, and replace it by the two terms *Cisalleghenian* for the Eastern and *Transalleghenian* for the Western districts. They are separated from each other by the Alleghenian district of the foothills and the Canadian of the summits of the Allegheny Mountains.

The species which are found over the entire Eastern subregion, and not elsewhere, are the following:

Amblystoma jeffersonianum Green.

Plethodon cinereus Green.

Rana silvatica Le Conte.

Rana palustris Le Conte.

Osceola dolata triangula Boie.

Natrix fasciata sipedon Linnaeus.

Eutania sirtalis graminea Cope.

The *Canadian* district is characterized by the following species, which are restricted to it:

Amblystoma jeffersonianum laterale Hallowell.

Gyrinophilus porphyriticus Green.

Desmognathus ochrophæus Cope.

Desmognathus nigra Green.

Bufo lentiginosus fowlerii Putnam.

Rana cantabrigensis Baird.

Rana septentrionalis Baird.

The list above given as universally distributed in the Eastern subregion characterizes the *Alleghenian* district. I know of no species

that is restricted to it. The genera which do not extend north of it are the following:

BATRACHIA.

Chorophilus.

Hyla.

Hemidactylium.

Cryptobranchus.

Necturus.

SAURIA.

Sceloporus.

Eumeces.

SERPENTES.

Carphophiops.

Coluber.

Cyclophis.

Natrix.

Ophibolus.

Heterodon.

Ancistrodon.

Sistrurus.

Crotalus.

The two remaining districts include the large number of species which are common to the Eastern and Austroriparian subregions enumerated under the latter head. The Cisallegheanian is further characterized by the following:

Hyla andersonii Baird.

Rana virgatipes Cope.

Ophibolus rhombomaculatus Holbrook.

To these must be added from the Austroriparian list:

Abastor erythrogrammus Daudin.

The following species are peculiar to the Transallegheanian district:

Chondrotus microstomus Cope.

Spelerpes maculicandus Cope.

Rana areolata circulosa Rice and Davis.

Carphophiops vermis Kennicott.

Coluber vulpinus Baird and Girard.

Ophibolus calligaster Say.

Eutania radix Baird and Girard.

Eutania butlerii Cope.

Tropidoclonium lineatum Hallowell.

Natrix kirtlandii Kennicott.

Sistrurus catenatus Rafinesque.

Probably *Eutania brachystoma* Cope belongs to this district, but only one specimen has been found.

The following species enter this district only from the Austroriparian:

Natrix grahamii Baird and Girard.

Eutania proxima Say.

Of the species peculiar to the Transallegheanian district, *Ophibolus calligaster* and *Tropidoclonium lineatum* extend into the northern limits of the Texan district.

The genera which do not range northward of the Cisallegheanian district are *Onemidophorus*, *Liolepisma*, and *Abastor*.

The total number of species of the Eastern subregion is thus:

Generally distributed	7
Peculiar to Cisalleghean	3
Peculiar to Transalleghean	9
Peculiar to Canadian	7
Common to Austroriparian	34
Total	60

II. THE AUSTRORIPARIAN SUBREGION.

This subregion is the range of a large number of species of *Batrachia* and *Reptilia*, only a part of which occupy it to the exclusion of all other subregions, and another series of which occupy parts only of its area. Three centers of distribution within its borders may be discerned—the *Ocmulgian*, the *Louisianian*, and the *Texan*. The *Texan* is especially characterized by the combination of the Austroriparian fauna with a considerable number of the species of the Sonoran subregion. The characteristic Austroriparian species are the following:

TRACHYSTOMATA.

Siren lacertina Linnæus.

URODELA.

Amphiuma means Garden.

Amblystoma talpoideum Holbrook.

Manculus quadridigitatus Holbrook.

SALIENTIA.

Bufo lentiginosus lentiginosus Shaw.

Chorophilus occidentalis Baird and Girard.

Hyla carolinensis Pennant.

Engystoma carolinense Holbrook.

LOBICATA.

Alligator mississippiensis Daudin.

SAURIA.

Ophisaurus ventralis Daudin.

Anolis carolinensis Linnæus.

SERPENTES.

Heterodon simus Linnæus.

Cyclophis æstivus Linnæus.

Zamenis flagelliformis Catesby.

Coluber spiloides Duméril and Bibron.

Comptosoma corais couperii Holbrook.

Osceola doliata sypila Cope.

Osceola doliata coccinea Schlegel.
Ophibolus getulus sayi Holbrook.
Oemophora coccinea Blumenbach.
Natrix clarkii Baird and Girard.
Natrix fasciata fasciata Linnæus.
Natrix fasciata erythrogaster Shaw.
Natrix cyclopium Duméril and Bibron.
Virginia valeriæ Baird and Girard.
Haldea striatula Linnæus.
Tantilla coronata Baird and Girard.
Elaps fulvius Linnæus.
Ancistrodon piscivorus Lacépède.
Sistrurus miliarius Linnæus.
Crotalus adamanteus adamanteus Beauvois.

Thirty-one species and subspecies.

The Austroriparian shares with the Floridan subregion all of the above species except *Coluber spiloides*, *Natrix clarkii*, *Virginia valeriæ*, and *Haldea striatula*, so far as yet known. It shares with the Eastern subregion the following thirty-four species:

PROTEIDA.

Necturus maculatus Rafinesque.

URODELA.

Cryptobranchus allegheniensis Daudin.
Amblystoma opacum Gravenhorst.
Amblystoma punctatum Linnæus.
Amblystoma tigrinum Green.
Plethodon glutinosus Green.
Spelerpes guttolineatus Holbrook.
Spelerpes ruber Daudin.
Desmognathus fusca Rafinesque.
Diemyctylus viridescens Rafinesque.
Bufo americanus americanus Le Conte.
Scaphiopus holbrookii Harlan.
Acris gryllus Le Conte.
Hyla versicolor Le Conte.
Rana pipiens pipiens Kalm.
Rana areolata Baird and Girard.
Rana clamata Daudin.
Rana catesbiana Shaw.

SAURIA.

Sceloporus undulatus Latreille.
Cnemidophorus sexlineatus Linnæus.
Eumeces quinquelineatus Linnæus.
Liolepisma laterale Say.

SERPENTES.

- Abastor erythrogrammus* Daudin.
Carphophiops amœnus Say.
Heterodon platyrhinus Latreille.
Diadophis punctatus Linnæus.
Liopeltis vernalis Linnæus.
Zamenis constrictor Linnæus.
Coluber obsoletus Say.
Pityophis melanolencus Daudin.
Ophibolus getulus getulus Linnæus.
Eutænia sirtalis sirtalis Linnæus.
Ancistrodon contortrix Linnæus.
Crotalus horridus Linnæus.

The following species are restricted to the eastern part of the Austroriparian subregion, not extending west of the Atlantic drainage. To this district I have given the name of *the Ocmulgian*.

PROTEIDA.

- Necturus punctatus* Gibbs.

URODELA.

- Stereochilus marginatum* Hallowell.
Chondrotus cingulatus Cope.

SALIENTIA.

- Bufo quercicus* Holbrook.
Chorophilus ornatus Holbrook.
Chorophilus oculatus Holbrook.

SERPENTES.

- Abastor erythrogrammus* Daudin.
Rhadinæa flavilatus Cope.
Coluber quadrivittatus Holbrook.
Natrix rigida Say.

The following species are restricted to the Ocmulgian and Louisanian districts with present information. First, all the Batrachia which the Austroriparian subregion shares with the Eastern, excepting *Amblystoma tigrinum*, *Diemyctylus viridescens*, *Acris gryllus*, *Rana areolata*. Second, *Farancia abacura* Holbrook; *Coluber guttatus* Linnæus.

The following species are to be added to the general Austroriparian (p. 1208), to form the list of the Texan district:

PROTEIDA.

- Typhlomolge rathbunii* Stejneger.

URODELA.

Diemictylus meridionalis Cope.

Chondrotus texanus Matthes.

SALIENTIA.

Bufo debilis Baird and Girard.

Bufo punctatus Baird and Girard.

Bufo valliceps Wiegmann.

Bufo compactilis Wiegmann.

Lithodytes latrans Cope.

Chorophilus triseriatus clarkii Baird and Girard.

SAURIA.

Holbrookia texana Troschel.

Holbrookia maculata Baird and Girard.

Crotaphytus collaris Say.

Sceloporus spinosus Wiegmann.

Sceloporus consobrinus Baird and Girard.

Phrynosoma cornutum Harlan.

Eublepharis variegatus Baird.

Gerrhonotus liocephalus Wiegmann.

Eumeces epipleurotus Cope.

Eumeces pachyurus Cope.

Eumeces brevilineatus Cope.

Eumeces tetragrammus Baird.

Eumeces obsoletus Baird and Girard.

SERPENTES.

Diadophis amabilis docilis Baird and Girard.

Diadophis amabilis stictogenys Cope.

Hypsiglena ochrorhynchus Cope.

Rhinochilus lecontei Baird and Girard.

Ooluber emoryi Baird and Girard.

Osceola doliata annulata Kennicott.

Ogmius episcopus episcopus Kennicott.

Natrix rhombifera Hallowell.

Natrix fasciata transversa Hallowell.

Virginia elegans Kennicott.

Eutania proxima Say.

Eutania elegans marciana Baird and Girard.

Eutania eques ocellata Cope.

Tantilla gracilis Baird and Girard.

Tantilla nigriceps Kennicott.

Sistrurus catenatus edwardsii Baird and Girard.

Crotalus adamanteus atrox Baird and Girard.

Sixty-one species and subspecies, making a total for the Austroriparian as follows:

Generally distributed.....	31
Shared with Eastern subregion.....	34
Ocmulgian only.....	10
Louisianian and Ocmulgian only.....	2
Texan exclusively (in the subregion).....	38
Total.....	115

The species which enter the Texan territory from the Sonoran extend to various distances to the north and east. Thus, *Crotaphytus collaris* ranges to southern Missouri, and *Holbrookia maculata* to Arkansas. *Sceloporus spinosus* extends along the Gulf States to western Florida. *Phrynosoma cornutum* extends eastward to Dallas, Texas. *Rhinochilus lecontei*, on the other hand, has not been found east of Austin. Several species from the extreme southwest of Texas have not been included in the above lists, since some of them are well known to belong to the Central American fauna, while the range of others is probably similar, but is not sufficiently known. Of the former kind are *Drymobius margaritiferus* Schlegel, *Sibon albofuscum* Lacépède, and *Coniophanes imperialis* Baird and Girard, of the latter are *Lysoptychus lateralis* Cope, *Holbrookia propinqua* Baird and Girard, and *Hypopachus cuneus* Cope.

III. THE FLORIDAN SUBREGION.

The species and subspecies peculiar to this subregion are the following:

BATRACHIA.

Pseudobranchius striatus Le Conte.
Hyla gratiosa Le Conte.
Rana areolata æsopus Cope.

SAURIA.

Eumeces egregius Baird.
Rhineura floridana Baird.

SERPENTES.

Coluber rosaceus Cope.
Coluber guttatus sellatus Cope.
Osceola doliata parallela Cope.
Stylosoma extenuatum Brown.
Eutænia sackenii Kennicott.
Seminatrix pygæa Cope.
Natrix usta Cope.
Natrix compressicauda Kennicott.
Natrix fasciata pictiventer Cope.
Liodytes allenii Garman.

Species which are wanderers from the West Indian region are:

Lithodytes ricordii Duméril and Bibron.

Sphaerodactylus notatus Baird.

Crocodilus americanus Laurenti.

The *Rhadinæa flavilatus* Cope ranges throughout both the Floridan subregion and the Ocmulgian district. One species, *Elaps distans* Kennicott, may be characteristic of the Floridan subregion, but only one specimen has been obtained.

Species which the Floridan subregion shares with the Austroriparian are the following:

TRACHYSTOMATA.

Siren lacertina Linnæus.

AMPHIUMOIDEA.

Amphiuma means Garden.

URODELA.

Plethodon glutinosus Green.

SALIENTIA.

Bufo lentiginosus lentiginosus Shaw.

Bufo quercicus Holbrook.

Hyla squirella Bosc.

Hyla femoralis Latreille.

Hyla carolinensis Pennant.

Acris gryllus Le Conte.

Chorophilus nigrilus Le Conte.

Scaphiopus holbrookii Harlan.

Rana pipiens sphenoccephala Cope.

Rana catesbiana Shaw.

LORICATA.

Alligator mississippiensis Daudin.

SAURIA.

Sceloporus undulatus Latreille.

Cnemidophorus sexlineatus Linnæus.

Liolepisma laterale Say.

Eumeces quinquelineatus Linnæus.

SERPENTES.

Heterodon simus Linnæus.

Diadophis punctatus Linnæus.

Abastor erythrogrammus Daudin.

Farancia abacura Holbrook.

Coluber guttatus Linnæus.

Coluber quadrivittatus Holbrook.

Zamenis constrictor Linnæus.

Zamenis flagellum Shaw.
Compsosoma corais couperii Holbrook.
Pityophis melanoleucus Daudin.
Ophibolus getulus getulus Linnæus.
Osceola doliata coccinea Schlegel.
Osceola elapsoidea Holbrook.
Storeria dekayi Storer.
Natrix fasciata erythrogaster Shaw.
Natrix cyclopium Duméril and Bibron.
Natrix taxispilotus Holbrook.
Eutaenia sirtalis sirtalis Linnæus.
Tantilla coronata Baird and Girard.
Elaps fulvius Linnæus.
Sistrurus miliarius Linnæus.
Crotalus adamanteus adamanteus Linnæus.

The total number of species of the Floridan subregion is as follows:

Peculiar species.....	15
Species common to the Ocmulgan district.....	1
Species common to the Louisianian district.....	40
Species common to the West Indian region.....	3
Little known species.....	2
Total.....	61

IV. THE SONORAN SUBREGION.

This subregion presents several natural divisions, as follows: I. The *Lower Californian district*, including only the region at the extremity of the peninsula of Lower California; II. The *Chihuahuan district*, embracing the State of Sonora, Mexico, the northern part of the Mexican Plateau, Arizona south of the San Francisco Mountains; most of the peninsula of Lower California, and most of New Mexico; III. The *Basin district*, embracing the Great Basin of Utah and Oregon, to Vernon, British Columbia; and IV. The *Central district*, which includes the high plains east of the Rocky Mountains, from Texas northward, excepting the river bottoms which cross it from west to east. This great subregion is bound together by the general distribution of numerous genera; but I do not know a single species which covers its entire area which is not found elsewhere. These define the districts.

The *Lower Californian district* is defined by the following fourteen species, which are restricted to it:

Hyla curta Cope.
Otenosaura hemilopha Cope.
Uta thalassina Cope.
Uta nigricauda Cope.
Phyllodactylus unctus Cope.
Cnemidophorus maximus Cope.
Euchirotres biporus Cope.
Lichanura trivirgata Cope.
Zamenis aurigulus Cope.

Phyllorhynchus decurtatus Cope.

Pityophis vertebralis Blainville.

Chilomeniscus stramineus Cope.

Tantilla planiceps Blainville.

Crotalus enyo Cope.

The district shares with the Chihuahuan the following species:

Bufo punctatus Baird and Girard.

Dipsosaurus dorsalis Hallowell.

Crotaphytus wislizenii Baird and Girard.

Callisaurus draconoides Blainville.

Sauromalus ater Duméril.

Uta stansburiana Baird and Girard.

Uta ornata Baird and Girard.

Sceloporus zosteromus Cope.

Phrynosoma coronatum Blainville.

Phyllodactylus tuberculosus Wiegmann.

Salvadora grahamiae Baird and Girard.

Ophibolus getulus boylii Baird and Girard.

Chilomeniscus fasciatus Cope.

Hypsiglena ochrorhynchus Cope.

Natrix valida Kennicott.

Eutania eque Reuss.

Trimorphodon lyrophanes Cope.

Crotalus adamanteus atrox Baird and Girard.

Crotalus mitchellii Cope.

Species common to the Lower Californian district and the Western subregion (mostly to the Diegan district) are the following:

Hyla regilla Baird and Girard.

Phrynosoma coronatum Blainville.

Verticaria hyperythra Cope.

Gerrhonotus multicarinatus Blainville.

Ophibolus getulus boylii Baird and Girard.

Ophibolus getulus californiae Blainville.

Plethodon croceator Cope.

Total species of the Lower Californian district:

Peculiar to it	14
Common to the Chihuahuan district	18
Common to the Western subregion	7
Total	39

Thirty-eight species, one being twice enumerated as common to the Chihuahuan district and Western region.

The *Chihuahuan district* possesses the following peculiar species:

SALIENTIA.

Bufo alvarius Girard.

Hyla arenicolor Cope.

SAURIA.

- Ctenosaura multispinis* Cope.
Crotaphytus reticulatus Baird.
Callisaurus notatus Baird.
Callisaurus rufopunctatus Cope.
Callisaurus inornatus Cope.
Callisaurus scoparius Cope.
Uta symmetrica Baird.
Uta bicarinata Duméril.
Uta graciosa Hallowell.
Sceloporus clarkii Baird and Girard.
Sceloporus couchii Baird and Girard.
Sceloporus jarrovi Cope.
Sceloporus ornatus Baird and Girard.
Phrynosoma solare Gray.
Anota modesta Girard.
Anota maccallii Hallowell.
Heloderma suspectum Cope.
Gerrhonotus multifasciatus Duméril and Bibron.
Cnemidophorus tessellatus Say.
Cnemidophorus inornatus Baird.
Cnemidophorus octolineatus Baird.
Cnemidophorus guttatus Baird and Girard.
Eumeces guttulatus Hallowell.

SERPENTES.

- Glauconia dissecta* Cope.
Glauconia dulcis Baird and Girard.
Glauconia humilis Baird and Girard.
Lichanura roseofusca Cope.
Diadophis regalis regalis Baird and Girard.
Heterodon nasicus kennerlyi Kennicott.
Zamenis semilineatus Cope.
Coluber emoryi Baird and Girard.
Rhinechis elegans Kennicott.
Pityophis sayi sayi Schlegel.
Epiglottophis pleurostictus Duméril and Bibron.
Ophibolus getulus splendidus Baird and Girard.
Chionactis occipitalis Hallowell.
Chilomeniscus ephippicus Cope.
Gyalopium canum Cope.
Eutaenia megalops Kennicott.
Eutaenia elegans marci Baird and Girard.
Eutaenia elegans dorsalis Baird and Girard.
Eutaenia angustirostris Kennicott.
Eutaenia nigrilatus Brown.

Eutænia rufopunctata Cope.
Eutænia multimaculata Cope.
Trimorphodon upsilon Cope.
Trimorphodon lambda Cope.
Trimorphodon wilkinsonii Cope.
Scolecophis æmulus Cope.
Elaps euryxanthus Kennicott.
Crotalus molossus Baird and Girard.
Crotalus scutulatus Kennicott.
Crotalus lepidus Kennicott.
Crotalus cerastes Hallowell.

Fifty-eight species, disposed of as follows: Batrachia Salientia, two; Sauria, twenty-five; Serpentes, thirty-one. Three species of Testudinata are peculiar to this district, namely, *Cinosternum henrici* Lecépède; *C. flavescens* Agassiz, and *Xerobates agassizii* Cooper. This district possesses a larger number of peculiar species than any other in the Medicolumbian Region.

The Basin district has but few peculiar species. Its southern boundary may be regarded as the San Francisco Mountains in northern Arizona. The *Crotalus tigris*, which is restricted to it, has been shown by Dr. Merriam to inhabit only the mountains, and its northern limit is as yet unknown. The following are the species of the Great Basin:

BATRACHIA.

Amblystoma tigrinum Green.
Spea intermontana Cope.*
Rana draytonii onca Cope.*
Rana pipiens brachycephala Cope.

SAURIA.

Orotaphytus collaris Say.†
Orotaphytus wislizenii Baird and Girard.†
Uta stansburiana Baird and Girard.†
Sceloporus biserialis Hallowell.†
Sceloporus graciosus Baird and Girard.†
Sceloporus consobrinus Baird and Girard.†
Phrynosoma douglassii ornatissimum Girard.*
Anota platyrhina Girard.†
Zamenis taniatus Hallowell.†
Pityophis sayi bellona Baird and Girard.†
Chionactis episcopa isizonus Cope.*
Eutænia elegans vagrans Baird and Girard.
Orotalus tigris Baird and Girard.*
Orotalus confluentus lecontei Hallowell.*

The species and subspecies peculiar to the Basin district are marked with a star, and those found also in the Chihuahuan with a dagger.

The *Central district* possesses but few peculiar species. These, with certain Chihuahuan species, give it a distinctive character. There are also a few species which enter it from the Eastern subregion. These are marked with a dagger, while the peculiar forms are marked with a star.

URODELA.

Amblystoma tigrinum Green.

SALIENTIA.

Bufo cognatus Say.*

Spea hammondi bombifrons Cope.*

SERPENTES.

Heterodon nasicus nasicus Baird and Girard.*

Ophibolus multistratus Kennicott.*

Zamenis constrictor Linnæus.†

Eutænia radix Baird and Girard.†

Eutænia sirtalis parietalis Say.

Eutænia elegans vagrans Baird and Girard.

Crotalus confluentus confluentus Say.*

SAURIA.

Crotaphytus collaris Say.

Holbrookia maculata Baird and Girard.

Phrynosoma douglassii hernandesii Girard.*

Eumeces septentrionalis Baird.*

Eumeces multivirgatus Hallowell.*

Eumeces obsoletus Baird and Girard.

The species not marked with dagger or star are Chihuahuan, except *Eutænia elegans vagrans*, which is also found in the Basin district; *E. sirtalis parietalis*, which extends to the Pacific district, and the *Amblystoma tigrinum*, which is Medicolumbian throughout.

The total number of species of the Sonoran subregion is as follows:

Peculiar to the Arizonian district.....	58
Common to the Lower California and Chihuahuan districts.....	19
Peculiar to the Lower California district	14
Peculiar to the Basin district	6
Common to the Basin and Chihuahuan	8
Peculiar to the Central district.....	8
Common to the Central and Chihuahuan	3
Common to the Chihuahuan and Texan.....	14
Counted twice.....	130
Total.....	126

V. THE WESTERN SUBREGION.

This subregion presents two distinct modifications, a northern and a southern. The boundary between the two has not yet been defined; it represents the demarkation between the greater humidity of the north and the arid conditions of the south. The name *Diegan* has been given by Mr. Van Denburgh to the southern region; to the northern I propose to restrict the name *Pacific*, which I formerly used for the entire subregion, which had been previously named the Western by Baird. The Pacific district extends farther south along the Sierra Nevada than in the San Joaquin Valley. Some of the forms of the Diegan district extend north to the latitude of San Francisco, but the majority of the species are restricted to more southern latitudes. How far the Diegan district extends on the Lower Californian Peninsula is uncertain. The separation from the Chihuahuan district is also undetermined, and the species of both districts mingle in some degree on their borders.

Species peculiar to the *Diegan district* are the following:

BATRACHIA.

Rufa columbiensis halophila Baird and Girard.

SAURIA.

Uta repens Van Denburgh.

Uta mearnsii Stejneger.

Sceloporus orcuttii Stejneger.

Sceloporus vandenbergianus Cope.

Phrynosoma cerroëense Stejneger.

Anota goodei Stejneger.

Xantusia vigilis Baird.

Xantusia riversiana Cope.

Xantusia picta Cope.

Zablepsis henshavi Stejneger.

Amacropsis gilbertii Van Denburgh.

Verticaria sericea Van Denburgh.

Onemidophorus tessellatus multiscutatus Cope.

Onemidophorus tessellatus rubidus Cope.

Anniella pulchra Gray.

SERPENTES.

Lichanura orcuttii Stejneger.

Diadophis amabilis amabilis Baird and Girard.

Crotalus ruber Cope.

To these must be added the species already enumerated as common to the Diegan and Lower California districts, and the following list of species which occur also in the Chihuahuan district:

Crotaphytus wislizenii Baird and Girard.

Oallisaorus draconoides Blainville.

Uta stansburiana Baird and Girard.

Sceloporus biseriatus Hallowell.

Lichanura roseofusca Cope.

Crotalus adamanteus atrox Baird and Girard.

The following species are common to the Diegan and Pacific districts:

BATRACHIA.

Diemyscylus torosus Eschscholtz.

Hyla regilla Baird and Girard.*

SAURIA.

Phrynosoma blainvilli Gray.

Gerrhonotus multicarinatus Blainville.*

Gerrhonotus burnettii Gray.

Eumeces skiltonianus Baird and Girard.

SERPENTES.

Charina bottæ Blainville.

Zamenis lateralis Hallowell.

Zamenis tæniatus Hallowell.*

Pityophis catenifer Blainville.

Ophibolus getulus boylii Baird and Girard.*

Eutænia elegans couchii Kennicott.*

Eutænia infernalis infernalis Blainville.

Crotalus confluentus lucifer Baird and Girard.

These species are then characteristic of the Western subregion as a whole, except those marked with a star, which occur elsewhere.

The Pacific district is especially characterized by certain genera and species of Batrachia. No certainly known genus of scaled reptiles and a limited number of species and subspecies are peculiar to it. Conspicuous among these are the species of *Eutænia*, which display great variety, while they are but sparsely represented in the Diegan district. The peculiar species are as follows:

URODELA.

Amblystoma macrodactylum Baird.

Amblystoma epixanthum Cope.

Chondrotus paroticus Baird.

Chondrotus decorticatus Cope.

Chondrotus aterrimus Cope.

Chondrotus tenebrosus Baird and Girard.

Batrachoseps caudatus Cope.

Batrachoseps attenuatus Eschscholtz.

Plethodon intermedius Baird.

Plethodon oregonensis Girard.

Autodax lugubris Hallowell.

Autodax iëcanus Cope.
Autodax ferreus Cope.
Diemyctylus torosus Eschscholtz.
Bufo columbiensis columbiensis Baird and Girard.
Spea hammondi hammondi Baird.
Rana temporaria pretiosa Baird.
Rana cantabrigensis latiremis Cope.
Rana agilis aurora Baird and Girard.
Rana draytonii Baird.
Rana boylii Baird.

SAURIA.

Sceloporus undulatus occidentalis Baird.
Phrynosoma douglassii douglassii Bell.
Gerrhonotus principis Baird and Girard.
Cnemidophorus septemvittatus Cope.

SERPENTES.

Diadophis amabilis pulchellus Baird and Girard.
Zamenis constrictor vetustus Baird and Girard.
Contia mitis Baird and Girard.
Eutænia elegans elegans Baird and Girard.
Eutænia elegans lineolata Cope.
Eutænia elegans ordinoides Baird and Girard.
Eutænia infernalis vidua Cope.
Eutænia sirtalis parietalis Say.
Eutænia sirtalis trilineata Cope.
Eutænia sirtalis pickeringii Baird and Girard.
Eutænia sirtalis tetratænia Cope.
Eutænia sirtalis concinna Hallowell.
Eutænia biscutata Cope.
Eutænia leptcephala Baird and Girard.

There are, therefore, peculiar to the Pacific district, eighteen species and three subspecies of Batrachia (two species found in the Holarctic region, represented by subspecies, and one species from the Canadian); two species and two subspecies of lizards; and three species and eleven subspecies of snakes.

We have of species and subspecies of the Western subregion the following synopsis:

Peculiar to the Diegan district	19
Common to the Diegan and Chihuahuan	6
Common to the Diegan and Pacific	11
Peculiar to the Pacific	39
Total	75

VI. THE TOLTECAN SUBREGION.

This subregion includes three districts which possess characteristic species and which differ in climate. The *Austroriparian* is a humid region, with abundant rains and fogs, and includes the eastern face and slope of the central plateau, with the mountain elevations, including parts of the States of Puebla, Vera Cruz, Hidalgo, and San Luis Potosi. It is cut off to the north from the *Austroriparian* subregion by an interval in the States of Nuevo Leon and Tamaulipas. The middle or *Austrocentral* district includes the valleys of Mexico and Toluca, and the region northward to the edge of the Sonoran subregion, including the State of Guanajuato, and perhaps farther north. The climate of this district is much less humid than that of the *Austroriparian* district. The *Austrooccidental* district includes the high lands of Oaxaca, Guerrero, Michoacan, and Jalisco. It is the most arid of the three divisions and extends farthest to the south and west.

The northern boundary of the *Toltecan subregion* is not yet determinable; hence it is not possible to state whether species from the States of Durango and Zacatecas, such as *Eutænia angustirostris*, should be referred to it or not. A small collection made by Wilkinson in southern Chihuahua at Batopilas¹ has the character of the Chihuahuan fauna, with the following species not otherwise found in it:

Anolis nebulosus Wiegmann.

Uta bicarinata Duméril.

Scolecophis æmulus Cope.

The humid and dry districts of the Toltecan subregion repeat *in petto* the differences between the *Austroriparian* and *Sonoran* subregions. The *Austroriparian* district is distinguished by the larger number of batrachian genera and species and of certain genera of *Crotalidæ*. It also includes some genera which may be regarded as immigrants from the Central American region of the Neotropical realm.

The characteristic species of the *Austrocentral* district are:²

URODELA.

Siredon mexicanum Shaw.

Amblystoma tigrinum Green.

SALIENTIA.

Bufo compactilis Wiegmann.

Bufo intermedius Günther.

Spea multiplicata Cope.

Spea hammondi Baird.

Hyla eximia Baird.

Hyla arenicolor Cope.

Rana montezumae Baird.

¹ Cope, Proc. Amer. Phil. Soc., 1879, p. 261.

² For the exact habitat of several of these I am indebted to the important papers of Dr. A. Dugès, in *La Nature*, 1888, p. 97, and 1896, p. 3.

TESTUDINATA.

Cinosternum pennsylvanicum.

Onychotria mexicana Gray.

SAURIA.

Phrynosoma orbiculare Wiegmann.

Sceloporus scalaris Wiegmann.

Sceloporus microlepidotus Wiegmann.

Barissia imbricata Wiegmann.

Cnemidophorus guttatus Baird and Girard.

Eumeces brevirostris Günther.

Sceloporus torquatus Green.

Sceloporus minor Cope.

Sceloporus melanogaster Cope.

Tantilla calamarina Cope.

Crotalus basiliscus Cope.

Crotalus polystictus Cope.

SERPENTES.

Conopsis nasus Günther.

Toluca lineata Kennicott.

Chionactis varians Jan.

Salvadora bairdii Jan.

Epiglottophis pleurostictus Duméril and Bibron.

Natrix storerioides Cope.

Eutania macrostemma Kennicott.

Eutania eques Reuss.

Eutania pulchrilatus Cope.

Eutania scaliger Jan.

Eutania melanogaster Wiegmann.

Tantilla bocourti Günther.

Of these species the following occur in the Chihuahuan district:

Amblystoma tigrinum Green.

Spea hammondi Baird.

Hyla arenicolor Cope.

Sceloporus scalaris Wiegmann.

Sceloporus microlepidotus Wiegmann.

Cnemidophorus guttatus Baird and Girard.

Epiglottophis pleurostictus Duméril and Bibron.

Eutania macrostemma Kennicott.

Eutania eques Reuss.

The Austroriparian district includes the mountainous region which bounds the Mexican Plateau on the east, from some part of the State of Puebla to a point to the north not yet ascertained. It is probably separated by a considerable interval from the Austroriparian in the

States of Tamaulipas and Nuevo Leon. Its climate is moist, and vegetation is abundant, and of principally Medicolumbian type. Various peculiar species of *Acer*, *Platanus*, *Quercus*, *Andromeda*, and other forms are abundant. The Batrachian and Reptilian species are the following:¹

URODELA.

Spelerpes chiropterus Cope.
Spelerpes leprosus Cope.
Spelerpes cephalicus Cope.
Spelerpes orizabensis Blatchley.
Spelerpes gibbicaudus Blatchley.
Edipina lineola Cope.
Thorius pennatulus Cope.

SALIENTIA.

Hyla gracilipes Cope.
Hyla miotypanum Cope.
Hyla distincta Cope.
Smilisca baudinii Duméril and Bibron.

SAURIA.

Sceloporus variabilis Wiegmann.
Sceloporus æneus Wiegmann.
Sceloporus microlepidotus Wiegmann.
Phrynosoma orbiculare Wiegmann.
Phrynosoma taurus Dugès.
Barissia imbricata Wiegmann.
Barissia antauges Cope.
Gerrhonotus gramineus Cope.
Gerrhonotus tæniatus Wiegmann.
Gerrhonotus liocephalus Wiegmann.
Celestus enneagrammus Cope.
Eumeces lynce Wiegmann.
Eumeces furcirostris Cope.
Lioleptus...a laterale Say.
Anelytropsis papillosus Cope.

SERPENTES.

Atractus semidoliatus Duméril and Bibron.
Atractus dubius Peters.
Atractus latifrontalis Garman.
Ficimia olivacea Gray.

¹ For a knowledge of the distribution of many of these species I am indebted to Francois Sumichrast, in Archives des Sciences, in Bibliotheque Universelle, 1873, p. 233, and through correspondence.

Epiglottophis lineaticollis Cope.
Osceola doliata polyzona Cope.
Ninia diademata Baird and Girard.
Storeria dekayi Storer.
Storeria occipitomaculata Holbrook.
Rhadinæa vittata Jan.
Rhadinæa decorata Günther.
Eutænia sumichrasti Cope.
Eutænia chrysocephala Cope.
Eutænia pulchrilatus Cope.
Eutænia scalaris Cope.
Eutænia phenax Cope.
Sibon frenatum Cope.
Sibon personatum Cope.
Sibon albofuscum Lacépède.
Bothriechis mexicanus Duméril and Bibron.
Ophryacus undulatus Jan.
Sistrurus ravus Cope.
Crotalus triseriatus Wagler.

Of all the above species the following are found also in the Austro-central district:

Barissia imbricata Wiegmann.
Sceloporus variabilis Wiegmann.
Sceloporus microlepidotus Wiegmann.
Phrynosoma orbiculare Wiegmann.
Eutænia pulchrilatus Cope.

Species found in the Austroriparian subregion.

Liolepisma laterale Say.
Storeria dekayi Storer.
Storeria occipitomaculata Holbrook.

To the Austroriental list might be added *Spelerpes bellii* Gray, which is stated by Sumichrast to inhabit also the Tierra Caliente; and *Anolis nannodes* Cope, which the same authority says ranges from the Tierra Caliente into the Alpine district. The water-snake *Natrix rhombifera* Hallowell may occur in the Austroriental district, but this needs confirmation.

The *Austroccidental* district is inhabited by a number of peculiar species, together with some which occur in the other two districts of the Toltecan subregion. One peculiarity of this district is the poverty in Batrachia and the absence of Urodela. The peculiar species are the following:

SALIENTIA.

Leptodactylus melanonotus Hallowell.
Hypopachus variolosus Cope.

SAURIA.

Sceloporus siniferus Cope.
Sceloporus horridus Wiegmann.
Sceloporus rubriventris Günther.
Sceloporus pyrrhocephalus Cope.
Sceloporus omiltemanus Günther.
Sceloporus dugesii Bocourt.
Sceloporus bullerii Boulenger.
Sceloporus heterolepis Boulenger.
Cnemidophorus deppei lineatissimus Cope.
Eumeces triaspis Cope.

SERPENTES.

Pseudoficimia frontalis Cope.
Sympholis lippiens Cope.
Atractus chalybæus Wagler.
Atractus omiltemanus Günther.
Adelophis copei Dugès.
Rhadinæa laureata Günther.
Eutænia godmanii Günther.
Chionactis michoacanensis Dugès.
Coniophanes grammophrys Dugès.
Coniophanes lateritius Cope.
Conophis vittatus Peters.
Himantodes gemmistratus latistratus Cope.
Sibon personatum Cope.
Manolepis nasutus Cope.

Of the above species there are found in the Tierra Caliente:

Sceloporus siniferus Cope.
Sceloporus horridus Wiegmann.
Sceloporus pyrrhocephalus Cope.
Conophis vittatus Peters.
Sibon personatum Cope.
Manolepis nasutus Cope.

And in the region south to Costa Rica:

Hypopachus variolosus Cope.
Himantodes gemmistratus Cope.

The Austroccidental district shares with the Austrocentral the following:

SALIENTIA.

Bufo compactilis Wiegmann.
Hyla eximia Baird.
Rana pipiens austriicola Cope.
Cnemidophorus guttatus Baird and Girard.
Sceloporus scalaris Wiegmann.
Phrynosoma orbiculare Wiegmann.
Anolis nebulosus Wiegmann.

SAURIA.

Phyllodactylus tuberculosus Wiegmann.
Uta bicarinata Duméril.
Barissia imbricata Wiegmann.
Natrix storerioides Cope.
Eutania eques Reuss.
Eutania melanogaster Wiegmann.
Epiglottophis pleurostictus Duméril and Bibron.

SERPENTES.

Drymobius margaritiferus Schlegel.
Diadophis latus Cope.
Osceola doliata polyzona Cope.
Natrix storerioides Cope.
Tantilla calamarina Cope.
Trimorphodon biscutatus Duméril and Bibron.
Trimorphodon upsilon Cope.
Crotalus triseriatus Wagler.
Crotalus polystictus Cope.
Crotalus basiliscus Cope.

A number of species inhabit the Austroccidental and Austroriental districts, passing to the southward of the Austrocentral, at least so far as present information extends. These are the following:

SALIENTIA.

Smilisca baudinii Duméril and Bibron

SAURIA.

Sceloporus torquatus Green.
Phrynosoma taurus Dugès.
Gerrhonotus oaxacæ Günther.

SERPENTES.

Rhadinæ vittata Jan.
Eutania chrysocephala Cope.
Coniophanes proterops Cope.
Ophryacus undulatus Jan.
Crotalus triseriatus Wagler.

The species of the Toltecan subregion are as follows:

Austroriental district	44
Austrocentral district	36
Austroccidental district	24
	73
Counted twice	2
Total	71

RECAPITULATION.

The number of species of Reptilia Squamata of the Medicolumbian region is as follows. The species of Batrachia have been already enumerated in my book on that class:¹

Superfamilies.	Families.	Genera.	Species.
SAURIA.			
Pachyglossa	Iguanidæ	12	74
Nyctisaura	Gecconidæ	2	7
	Eublepharidæ	1	1
Helodermatoidea	Helodermatidæ	1	1
Diploglossa	Anguidæ	4	17
Leptoglossa	Tiliidæ	2	11
	Xantusiidæ	3	5
	Scincidæ	2	32
	Anelytropidæ	1	1
Annielloidea	Anniellidæ	1	1
Annulati	Euchiridæ	1	1
	Amphisbenidæ	1	1
Total		31	143
SERPENTES.			
Catodonta	Glauconidæ	1	3
Colubroides	Boidæ	1	3
	Charinidæ	1	2
	Colubridæ	26	126
	Dipsadidæ	10	19
	Elapidæ	1	3
Solenoglypha	Crotalidæ	5	25
Total		45	191
Sauria		31	143
Total Squamata		76	334

¹The Batrachia of North America, Bulletin of the U. S. National Museum, No. 34, 1889, p. 451. The species of the Toltecan subregion are mostly omitted from this work

EXPLANATION OF PLATES.

It was the intention of Professor Cope to have included a much larger number of plates with this paper, but his death having occurred before the text was put in type, and as no memoranda were available concerning his intentions in the matter, it has been impossible to supply the deficiency. The plates herewith are those of which copies were included with the text.

PLATE 1.

Hyoid Bones of Sauria Rhiptoglossa and Acrodonta.

- Fig. 1. *Sphenodon punctatum* Gray; from specimen presented by Sir James Hector.
 2. *Chamaeleon* sp.; from Cuvier.
 3. *Gecko verticillatus* Laurenti; from Cuvier.
 4. *Aristelliger praeignis* Hallowell; dissected and drawn by Dr. E. E. Galt.
 5. *Phyllodactylus tuberculatus* Wiegmann; dissected and drawn by Dr. E. E. Galt.
 6. *Thecadactylus rapicaudus* Houtt.
 7. *Eublepharis elegans* Gray; Dr. Galt.
 8. *Eublepharis variegatus* Baird.
 9. *Calotes cristatellus* Kuhl.
 10. *Phrynocephalus mystaceus* Pallas.
 11. *Uromastix hardwickii* Gray; from the Zoological Garden, Philadelphia.
 12. *Holbrookia maculata* Girard; from specimen from Otto Lerch, San Angelo, Texas.

Bh, basihyal; *CBI*, first ceratobranchial; *CBII*, second ceratobranchial; *Ch*, ceratohyal; *EBI*, epibranchial; *Gh*, glossohyal; *Hh*, hypohyal.

PLATE 2.

Hyoid Bones of Sauria Iguania and Diploglossa.

- Fig. 12. *Phrynosoma coronatum* Blainville; Dr. E. E. Galt.
 14. *Sceloporus undulatus* Daudin.
 15. *Uta stansburiana* Baird and Girard.
 16. *Sauromalus ater* Duméril.
 17. *Crotaphytus wislizenii* Baird and Girard.
 18. *Anolis carolinensis* Duméril and Bibron.
 19. *Ctenosaura teres* Harlan (not adult).
 20. *Iguana tuberculata* Laurenti; from Cuvier.
 21. *Anguis fragilis* Linnæus; from northern Italy.
 22. *Eracœna guianensis* Daudin; from specimen from Zoological Garden, Philadelphia.

CBI, first ceratobranchial; *CBII*, second ceratobranchial; *Ch*, ceratohyal; *Hh*, hypohyal.

PLATE 3.

Hyoid Bones of Sauria Diploglossa, Thecaglossa, and Leptoglossa.

- Fig. 23. *Gerrhonotus multicarinatus* Blainville; Dr. E. E. Galt.
 24. *Ophisaurus ventralis* Daudin; Dr. Galt.
 25. *Heloderma suspectum* Cope; Dr. Galt.

Fig. 26. *Xenosaurus grandis* Gray.

27. *Varanus niloticus* Linnaeus; Dr. Galt.

28. *Scincus officinalis* Laurenti; from Cuvier.

29. *Egernia cunninghamii* Gray; the ends of the ceratobranchials are cut off in the specimen.

30. *Eumeces fasciatus* Linnaeus; Dr. Galt.

31. *Liolepisma laterale* Say; from Hidalgo, Mexico (*L. gemmingerii*).

32. *Gongylus ocellatus* Forskal.

CBI, first ceratobranchial; *CBII*, second ceratobranchial; *Ch*, ceratohyal; *EBI*, epibranchial; *Gh*, glossohyal; *Hh*, hypohyal.

PLATE 4.

Hyoid Bones of Sauria Leptoglossa and Annulati.

Fig. 33. *Celestus striatus* Gray.

34. *Gerrhosaurus nigrolineatus* Hallowell.

35. *Zonurus cordylus* Linnaeus.

36. *Mancus macrolepis* Cope.

37. *Xantusia riversiana* Cope.

38. *Lepidophyma flavomaculatum* Duméril.

39. *Psammodromus algirus* Linnaeus.

40. *Lacerta ocellata* Daudin.

41. *Tupinambis teguexin* Daudin; from Cuvier.

42. *Cnemidophorus tessellatus* Say.

43. *Anniella pulchra* Gray; from specimen from James S. Lippincott.

44. *Chirotos canaliculatus* Bonnaert.

45. *Amphisbena alba* Linnaeus.

46. *Rhineura floridana* Baird.

Bh, basihyal; *CBI*, first ceratobranchial; *CBII*, second ceratobranchial; *Ch*, ceratohyal; *EB*, epibranchial; *Est*, epistapedial; *Gh*, glossohyal; *Hh*, hypohyal; *SSt*, suprastapedial; *St*, stapes.

PLATE 5.

Color Variations of *Cnemidophorus tessellatus* and of *Cnemidophorus gularis*.

A.—Young of *C. tessellatus* (*C. gracilis* Baird and Girard).

B.—*C. tessellatus perplexus* Baird and Girard.

C.—*C. tessellatus tessellatus* Say.

D.—*C. tessellatus tessellatus*.

E.—*C. tessellatus tessellatus*.

F.—*C. tessellatus rubidus* Cope.

G.—*C. gularis gularis*; young; and adolescent (sp. from Rio Grande, Captain Livermore).

H.—*C. gularis gularis* Baird and Girard; adult.

I.—*C. gularis scalaris* Cope.

K.—*C. gularis scalaris* Cope.

L.—*C. gularis semifasciatus* Cope.

PLATE 6.

Viscera of *Typhlops liberiensis* Hallowell.

CA, corpus adiposum; *Car*, carotid; *F*, fontanelle; *GB*, gall bladder; *H*, heart; *I*, intestine; *K*, kidney; *L*, liver; *Od*, oviduct; *Oe*, esophagus; *Or*, ovary; *R*, rectum; *RL*, right lung; *S*, stomach; *Sp*, spleen; *TL*, tracheal lung; *Tr*, trachea; *U*, ureter; *VC*, vena cavi.

PLATE 7.

Viscera of *Charina bottæ* Blainville.

AR, aorta root; *C*, cæcum; *CA*, corpus adiposum; *Car*, carotid; *G*, gall bladder; *H*, heart; *I*, intestine; *K*, kidney; *L*, liver; *LL*, left lung; *Oe*, œsophagus; *R*, rectum; *RL*, right lung; *S*, stomach; *Sp*, spleen; *T*, testis; *Tr*, trachea; *U*, ureter; *VC*, vena cavi; *VD*, vas deferens.

PLATE 8.

Viscera of *Chersydrus granulatus* Merrem.

AR, aorta root; *Car*, carotid; *Cl*, cloaca; *F*, fontanelle; *H*, heart; *I*, intestine; *K*, kidney; *LL*, left lung; *Od*, oviduct; *Oe*, œsophagus; *Or*, ovary; *R*, rectum; *S*, stomach; *TL*, tracheal lung; *Tr*, trachea; *VC*, vena cavi.

PLATE 9.

Viscera of *Coluber quadrivittatus* Holbrook.

AR, aorta root; *Car*, carotid; *GB*, gall bladder; *H*, heart; *I*, intestine; *K*, kidney; *L*, liver; *LL*, left lung; *Oe*, œsophagus; *R*, rectum; *RL*, right lung; *S*, stomach; *Sp*, spleen; *T*, testis; *Tr*, trachea; *U*, ureter; *VC*, vena cavi; *VD*, vas deferens.

PLATE 10.

Viscera of *Heterodon platyrhinus* Latreille.

AR, aorta root; *CA*, corpus adiposum; *Car*, carotid; *Cl*, cloaca; *F*, fontanelle; *GB*, gall bladder; *H*, heart; *I*, intestine; *K*, kidney; *L*, liver; *LL*, left lung; *Od*, oviduct; *Oe*, œsophagus; *Or*, ovary; *R*, rectum; *RL*, right lung; *Sp*, spleen; *St*, stomach; *Tr*, trachea; *U*, ureter; *V*, vagina; *VC*, vena cavi.

PLATE 11.

Viscera of *Crotalus confluentus* Say.

AR, aorta root; *CA*, corpus adiposum; *Car*, carotid; *F*, fontanelle; *GB*, gall bladder; *H*, heart; *I*, intestine; *K*, kidney; *L*, liver; *LL*, left lung; *Od*, oviduct; *Oe*, œsophagus; *Or*, ovary; *R*, rectum; *Sp*, spleen; *St*, stomach; *TL*, tracheal lung; *Tr*, trachea; *U*, ureter; *V*, vagina; *VC*, vena cavi.

PLATE 12.

Hemipenes of representative types.

The figures on Plates 12 to 31, excepting fig. 9, Plate 22, represent the hemipenis of a side split open so as to show the structures that are exhibited by the entire circumference. Each figure is therefore twice as wide as the organ in its normal condition. Where the organ is bifurcate one branch only is split, the other being represented as invaginated, and with a portion of the retractor muscle continuous with its apex.

Fig. 1. *Ilysia scytale* Linnaeus; Brazil.

2. *Epicrates angulifer* Duméril and Bibron; Cuba.

3. *Charina bottæ* Blainville; Oregon.

4. *Holarchus ancorus* Girard; Philippine Islands.

5. *Oligodon subquadratus* Duméril and Bibron; Java.

6. *Bascanium constrictor* Linnaeus; North America.

7. *Opheomorphus alticola* Cope; Peru.

Fig. 26. *Xenosaurus grandis* Gray.

27. *Varanus niloticus* Linnaeus; Dr. Galt.

28. *Scincus officinalis* Laurenti; from Cuvier.

29. *Egernia cunninghami* Gray; the ends of the ceratobranchials are cut off in the specimen.

30. *Eumeces fasciatus* Linnaeus; Dr. Galt.

31. *Liolepisma laterale* Say; from Hidalgo, Mexico (*L. gemmingerii*).

32. *Gongylus ocellatus* Forskal.

CBI, first ceratobranchial; *CBII*, second ceratobranchial; *Ch*, ceratohyal; *EBI*, epibranchial; *Gh*, glossohyal; *Hh*, hypohyal.

PLATE 4.

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Fig. 33. *Celestus striatus* Gray.

34. *Gerrhosaurus nigrolineatus* Hallowell.

35. *Zonurus cordylus* Linnaeus.

36. *Mancus macrolepis* Cope.

37. *Xantusia riversiana* Cope.

38. *Lepidophyma flavomaculatum* Duméril.

39. *Psammmodromus algirus* Linnaeus.

40. *Lacerta ocellata* Daudin.

41. *Tupinambis teguixin* Daudin; from Cuvier.

42. *Cnemidophorus tessellatus* Say.

43. *Anniella pulchra* Gray; from specimen from James S. Lippincott.

44. *Chirotus canaliculatus* Bonnaert.

45. *Amphisbena alba* Linnaeus.

46. *Rhineura floridana* Baird.

Bh, basihyal; *CBI*, first ceratobranchial; *CBII*, second ceratobranchial; *Ch*, ceratohyal; *EB*, epibranchial; *ES*, epistapedial; *Gh*, glossohyal; *Hh*, hypohyal; *SS*, suprastapedial; *St*, stapes.

PLATE 5.

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A.—Young of *C. tessellatus* (*C. gracilis* Baird and Girard).

B.—*C. tessellatus perplexus* Baird and Girard.

C.—*C. tessellatus tessellatus* Say.

D.—*C. tessellatus tessellatus*.

E.—*C. tessellatus tessellatus*.

F.—*C. tessellatus rubidus* Cope.

G.—*C. gularis gularis*; young; and adolescent (sp. from Rio Grande, Captain Livermore).

H.—*C. gularis gularis* Baird and Girard; adult.

I.—*C. gularis scalaris* Cope.

K.—*C. gularis scalaris* Cope.

L.—*C. gularis semifasciatus* Cope.

PLATE 6.

Viscera of *Typhlops liberiensis* Hallowell.

CA, corpus adiposum; *Car*, carotid; *F*, fontanelle; *GB*, gall bladder; *H*, heart; *I*, intestine; *K*, kidney; *L*, liver; *Od*, oviduct; *Oe*, esophagus; *Or*, ovary; *R*, rectum; *RL*, right lung; *S*, stomach; *Sp*, spleen; *TL*, tracheal lung; *Tr*, trachea; *U*, ureter; *VC*, vena cavi.

PLATE 7.

Viscera of *Charina bottæ* Blainville.

AR, aorta root; *C*, cœcum; *CA*, corpus adiposum; *Car*, carotid; *G*, gall bladder; *H*, heart; *I*, intestine; *K*, kidney; *L*, liver; *LL*, left lung; *Oe*, œsophagus; *R*, rectum; *RL*, right lung; *S*, stomach; *Sp*, spleen; *T*, testis; *Tr*, trachea; *U*, ureter; *VC*, vena cavi; *VD*, vas deferens.

PLATE 8.

Viscera of *Chersydrus granulatus* Merrem.

AR, aorta root; *Car*, carotid; *Cl*, cloaca; *F*, fontanelle; *H*, heart; *I*, intestine; *K*, kidney; *LL*, left lung; *Od*, oviduct; *Oe*, œsophagus; *Or*, ovary; *R*, rectum; *S*, stomach; *TL*, tracheal lung; *Tr*, trachea; *VC*, vena cavi.

PLATE 9.

Viscera of *Coluber quadri vittatus* Holbrook.

AR, aorta root; *Car*, carotid; *GB*, gall bladder; *H*, heart; *I*, intestine; *K*, kidney; *L*, liver; *LL*, left lung; *Oe*, œsophagus; *R*, rectum; *RL*, right lung; *S*, stomach; *Sp*, spleen; *T*, testis; *Tr*, trachea; *U*, ureter; *VC*, vena cavi; *VD*, vas deferens.

PLATE 10.

Viscera of *Heterodon platyrhinus* Latreille.

AR, aorta root; *CA*, corpus adiposum; *Car*, carotid; *Cl*, cloaca; *F*, fontanelle; *GB*, gall bladder; *H*, heart; *I*, intestine; *K*, kidney; *L*, liver; *LL*, left lung; *Od*, oviduct; *Oe*, œsophagus; *Or*, ovary; *R*, rectum; *RL*, right lung; *Sp*, spleen; *St*, stomach; *Tr*, trachea; *U*, ureter; *V*, vagina; *VC*, vena cavi.

PLATE 11.

Viscera of *Crotalus confluentus* Say.

AR, aorta root; *CA*, corpus adiposum; *Car*, carotid; *F*, fontanelle; *GB*, gall bladder; *H*, heart; *I*, intestine; *K*, kidney; *L*, liver; *LL*, left lung; *Od*, oviduct; *Oe*, œsophagus; *Or*, ovary; *R*, rectum; *Sp*, spleen; *St*, stomach; *TL*, tracheal lung; *Tr*, trachea; *U*, ureter; *V*, vagina; *VC*, vena cavi.

PLATE 12.

Hemipenes of representative types.

The figures on Plates 12 to 31, excepting fig. 9, Plate 22, represent the hemipenis of a side split open so as to show the structures that are exhibited by the entire circumference. Each figure is therefore twice as wide as the organ in its normal condition. Where the organ is bifurcate one branch only is split, the other being represented as invaginated, and with a portion of the retractor muscle continuous with its apex.

Fig. 1. *Ilysia scytale* Linnaeus; Brazil.

2. *Epicrates angulifer* Duméril and Bibron; Cuba.

3. *Charina bottæ* Blainville; Oregon.

4. *Holarochus ancorus* Girard; Philippine Islands.

5. *Oligodon subquadratus* Duméril and Bibron; Java.

6. *Bascanium constrictor* Linnaeus; North America.

7. *Opheomorphus alticola* Cope; Peru.

Fig. 8. *Natrix fasciata sipedon* Linnaeus; North America.

9. *Naja haje* Linnaeus *melanoleuca* Hallowell; West Africa.

10. *Bitis arietans* Linnaeus; South Africa.

11. *Crotalus confluentus* Say; Texas.

bh, basal hook; *cl*, calyculi or ruches; *f*, flosses; *l*, laminae; *p*, papillae; *sp*, spines; *Spl*, spinules; *SS*, sulcus spermaticus.

PLATE 13.

Hemipenes of Peropoda, Acrochordidae, and Calamariinae.

Fig. 1. *Boa constrictor* Linnaeus; Brazil.

2. *Eunectes murinus* Linnaeus; Brazil.

3. *Chilobothrus striatus* Fischer; Haiti.

4. *Enygrus bibronii* Duméril and Bibron; Fiji Islands.

5. *Lichanura trivirgata* Cope; Lower California.

6. *Eryx jaculus* Linnaeus; western Asia.

7. *Python spilotes* Lacépède; Australia.

8. *Ungalia melanura* Duméril and Bibron; Cuba.

9. *Calamaria gerraisii* Duméril and Bibron; Philippine Islands.

10. *Holarchus dolleyanus* Cope; Hainan.

11. *Dicrauxis purpurascens* Schlegel; Malaysia.

12. *Paras mullendorffi* Boettger; Hainan.

13. *Acrochordus granulatus* Merrem; Siam.

PLATE 14.

Hemipenes of Colubrinae.

Fig. 1. *Drymobius bifossatus* Raddi; Brazil.

2. *Coluber flavescens* Laurenti; Italy.

3. *Ptyophis sayi* Schlegel; western North America.

4. *Zamenis ravergeri* Menetries; Persia.

5. *Zamenis korros* Linnaeus; Siam.

6. *Cynophis helenæ* Daudin; Ceylon.

7. *Spilotes sebaeus* Cope; Surinam.

PLATE 15.

Hemipenes of Colubrinae.

Fig. 1. *Comptosoma corais* Cuvier; Brazil.

2. *Comptosoma virgatum* Schlegel; Asia.

3. *Comptosoma parvilocostoma* Wiedmann; Brazil.

4. *Gonyosoma oxycephalum* Reims; India.

5. *Herpetodryas carinatus* Linnaeus; Brazil.

6. *Crossanthera melanotropis* Cope; Costa Rica.

7. *Cyclophis modestus* Martens; western Asia.

8. *Contia mitis* Baird and Girard; California.

PLATE 16.

Hemipenes of Colubrinae.

Fig. 1. *Bascanium flagelliforme* Laurenti; Florida.

2. *Drymobius reticulatus* Peters; Peru.

3. *Drymobius hoddartii* Seitz; Mexico.

4. *Drymobius pulcherrimus* Cope; Nicaragua.

5. *Zamenis hippocrepis* Linnaeus; Italy.

6. *Entechinus major* Günther; China.

- Fig. 7. *Salvadora bairdii* Jan; Mexico.
 8. *Macropododon cucullatus* Duméril and Bibron; Algiers.
 9. *Geagras frontalis* Cope; Yucatan.
 10. *Ficimia olivacea* Gray; Mexico.
 11. *Chilomeniscus ephippicus* Cope; California.
 12. *Stylosoma extenuatum* Brown; Florida.
 13. *Hypsiglena ochrorhynchus* Cope; Texas.

PLATE 17.

Hemipenes of Colubrinæ.

- Fig. 1. *Drymobius margaritiferus* Schlegel; Mexico.
 2. *Cacocalyx percarinatus* Cope; Costa Rica.
 3. *Cyclophis æstivus* Linnæus; North America.
 4. *Phyllorhynchus brownii* Stejneger; Arizona.
 5. *Leptophis akaetulla* Linnæus; Brazil.
 6. *Leptophis præstans* Cope; Central America.
 7. *Thrasops flavigularis* Hallowell; West Africa.
 8. *Dendrophis picta* Linnæus; India.
 9. *Bucephalus capensis* Thunberg; South Africa.
 10. *Dasyplettis palmarum* Leach; West Africa.
 11. *Cemophora coccinea* Blumenbach; Florida.

PLATE 18.

Hemipenes of Colubrinæ.

- Fig. 1. *Trimetopon pliolepis* Cope; Costa Rica.
 2. *Conopsis nasus* Günther; Mexico.
 3. *Oseola elapsoidea* Holbrook; Florida.
 4. *Oseola doliata triangulum* Boie; New York.
 5. *Ophibolus rhombomaculatus* Holbrook; District of Columbia.
 6. *Ophibolus calligaster* Say; Kansas.
 7. *Ophibolus getulus* Linnæus; North America.
 8. *Coronella girundica* Daudin; Italy.
 9. *Proterodon tessellatus* Hallowell; Japan.
 10. *Dianodon rufozonatus* Cantor; China.
 11. *Symphimus leucostomus* Cope; Mexico.
 12. *Rhinochilus lecontei* Baird and Girard; Texas.

PLATE 19.

Hemipenes of Colubrinæ and Natricinæ.

- Fig. 1. *Herpetodryas melas* Cope; Costa Rica.
 2. *Drymobius rhombifer* Günther; Ecuador.
 3. *Coluber emoryi* Baird and Girard; Texas.
 4. *Ltopenlis vernalis* Harlan; United States.
 5. *Acanthocalyx ventrimaculatus* Gray; western Asia.
 6. *Tylanthera florulenta* Geoffroy; western Asia.
 7. *Contia episcopa* Kennicott; Texas.
 8. *Ophibolus californiæ* De Blainville; Lower California.
 9. *Adelphicus quadrivirgatus* Jan; Central America.
 10. *Ablabes baliodirus* Boie; Malaysia.
 11. *Eutania multimaculata* Cope; Chihuahua.

PLATE 20.

Hemipenes of Natricinae.

- Fig. 1. *Natrix rhombifera* Hallowell; Texas.
 2. *Natrix vulgeris* Laurenti; Italy.
 3. *Eutania sirtalis* Linnaeus; North America.
 4. *Eutania melanogaster* Wiegmann; Mexico.
 5. *Natrix kirtlandii* Kennicott; North America.
 6. *Bothrodytes ceylonensis* Günther; Ceylon.
 7. *Bothrodytes tigrinus* Boie; Japan.
 8. *Bothrodytes piscator* Schneider; India.
 9. *Bothrodytes spilogaster* Boie; Java.
 10. *Storeria dekayi* Storer; North America.
 11. *Storeria occipitomaculata* Holbrook; North America.
 12. *Tropidoclonium lineatum* Hallowell; Texas.

PLATE 21.

Hemipenes of Natricinae and Homalopsinae.

- Fig. 1. *Eutania proxima* Say; Texas.
 2. *Natrix septemvittata* Say; Pennsylvania.
 3. *Natrix grahamii* Baird and Girard; Texas.
 4. *Natrix hydrus* Pallas; southern Europe.
 5. *Natrix riparina* Merrem; Italy.
 6. *Natrix stolata* Linnaeus; Hainan, China.
 7. *Natrix storerioides* Cope; Mexico.
 8. *Liodytes allenii* Garman; Florida.
 9. *Virginia valeria* Baird and Girard; Texas.
 10. *Haldea striatula* Linnaeus; Texas.
 11. *Ceratophallus vittatus* Linnaeus; Java.
 12. *Herpeton tentaculatum* Lacépède; Siam.
 13. *Homalopsis buccata* Linnaeus; Siam.
 14. *Cerberus rhynchops* Schneider; India.
 15. *Cantorina elapiformis* Peters; Siam.

PLATE 22.

Hemipenes of Lycodontinae.

- Fig. 1. *Lycodon aulicus* Linnaeus; India.
 2. *Anoplophallus maculatus* Hallowell.
 3. *Boaodon virgatus* Hallowell; West Africa.
 4. *Boaodon infernalis* Günther; South Africa.
 5. *Lamprophis inornatus* Duméril and Bibron; South Africa.
 6. *Lycophidium laterale* Hallowell; West Africa.
 7. *Elapops modesta* Günther; West Africa.
 8. *Dromicodrygas bernierii* Duméril and Bibron; Madagascar.
 9. *Pseudaspis cana* Linnaeus; South Africa; the hemipenis in natural erection and not split, one-half not fully evaginated; from the outside; a, from above.
 10. *Homalosoma lutrix* Linnaeus; South Africa.
 11. *Anomalodon madagascariensis* Duméril and Bibron; Madagascar.

PLATE 23.

Hemipenes of Dromicinae and Leptognathinae.

- Fig. 1. *Hypsirhynchus feror* Günther; Haiti.
 2. *Dromicus parrifrons* Cope; Haiti.
 3. *Ocyophis ater* Gosse; Jamaica.
 4. *Alsophis angulifer* Duméril and Bibron; Cuba.
 5. *Farancia abacura* Holbrook; Louisiana.
 6. *Carphophiops amana* Say; North America.
 7. *Echinanthera cyanopleura* Cope; southern Brazil.
 8. *Rhadinæa decorata* Günther; Mexico.
 9. *Pliocercus elapoides* Cope; Mexico.
 10. *Ninia atrata* Hallowell; Mexico.
 11. *Tretanorhinus variabilis* Duméril and Bibron; Cuba.
 12. *Abaster erythrogrammus* Dandin; Georgia, North America.
 13. *Petalognathus nebulata* Linnaeus; Costa Rica.

PLATE 24.

Hemipenes of Xenodontinae and Dromicinae.

- Fig. 1. *Aporophis anomalus* Günther; Paraguay.
 2. *Xenodon almadensis* Wagler; Brazil.
 3. *Opheomorphus typhlus* Linnaeus; Brazil.
 4. *Opheomorphus cobella* Linnaeus; Brazil.
 5. *Xenodon severus* Linnaeus; Brazil.
 6. *Lystrophis orbignyi* Duméril and Bibron; Brazil.
 7. *Pseudoeryx plicatilis* Linnaeus; Brazil.
 8. *Helicops fumigatus* Cope; Brazil.
 9. *Rhabdosoma badium* Boie; Upper Amazon.
 10. *Rhabdosoma elaps* Günther; Upper Amazon.
 11. *Acanthophallus colubrinus* Günther; Brazil.
 12. *Uromacer oxyrhynchus* Duméril and Bibron; Haiti.
 13. *Amastridium veliferum* Cope; Panama.
 14. *Diadophis regalis* Baird and Girard; Arizona.

PLATE 25.

Hemipenes of Xenodontinae, Dromicinae, and Scytalinae.

- Fig. 1. *Xenodon regina* Linnaeus var.; Venezuela.
 2. *Opheomorphus brachyurus* Cope; Brazil.
 3. *Hydrops marthi* Spix; Brazil.
 4. *Teniophallus nicagus* Cope; Brazil.
 5. *Monobothris chamissonis* Wiegmann; Peru.
 6. *Rhadinæa flarilatus* Cope; Florida.
 7. *Hydrocalamus quinquevittatus* Duméril and Bibron; Mexico.
 8. *Philodryas viridissimus* Linnaeus; Brazil.
 9. *Thamnodynastes strigatus* Günther; southern Brazil.
 10. *Thamnodynastes nattererii* Mikai; southern Brazil.
 11. *Tachymenis peruvianus* Wiegmann; Peru.
 12. *Tomodon ocellatus* Duméril and Bibron; Uruguay.
 13. *Rhinostoma nasuum* Wagler; South America.
 14. *Scytale coronatum* Schneider; South America.
 15. *Langaha nasuta* Shaw; Madagascar.
 16. *Grayia smythii* Leach; West Africa.

PLATE 26.

Hemipenes of *Erythrolamprinae* and *Scytalinae*

- Fig. 1. *Erythrolamprus venustissimus* Boie; Brazil.
 2. *Conopsis lineatus* Duméril and Bibron; Mexico.
 3. *Jaliris dorsalis* Günther; Hayti.
 4. *Oxyrrhopus plumbeus* Wiedmann; Brazil.
 5. *Oxyrrhopus petalarius* Linnaeus; Brazil.
 6. *Philodryas nattererii* Steindachner; Paraguay.
 7. *Philodryas schottii* Fitzinger; Paraguay.
 8. *Contiophanes fissidens* Günther; Central America.

PLATE 27.

Hemipenes of *Dromicinae*, *Leptognathinae*, *Erythrolamprinae*, and *Dipsadinae*.

- Fig. 1. *Heterodon nasicus* Baird and Girard; Dakota.
 2. *Heterodon platyrhinus* Latreille; North America.
 3. *Mesopeltis sanniolus* Cope; Yucatan.
 4. *Leptoganthus anthracops* Cope; Nicaragua.
 5. *Tantilla rubra* Cope; Mexico.
 6. *Elapomorphus michoacanensis* Dugès; Mexico.
 7. *Uriechis microlepidotus* Günther; Natal.
 8. *Stenorhina ventralis* Duméril and Bibron; Mexico.
 9. *Dipsadomorphus trigonatus* Schneider; Malacca.
 10. *Psammodynastes pulcrulentus* Boie; Tonquin.
 11. *Dryophis fulgidus* Daudin; Central America.
 12. *Lygophis elegans* Tschudi; Peru.

Letter *p*, apical disc; *p'*, same in profile, enlarged.

PLATE 28.

Hemipenes of *Dipsadinae*.

- Fig. 1. *Dipsadomorphus fuscus* Gray; Australia.
 2. *Dipsas dendrophila* Reinwardt; Java.
 3. *Himantodes gemmistratus* Cope; western Mexico.
 4. *Rhinobothryum lentiginosum* Scopoli; Brazil.
 5. *Sibon septentrionale* Kennicott; Mexico.
 6. *Sibon nigrofasciatum* Günther; Nicaragua.
 7. *Trimorphodon biscutatus* Duméril and Bibron; Mexico.
 8. *Crotaphopeltis rufescens* Gmelin; Africa.
 9. *Chrysopelca ornata* Shaw; India.
 10. *Procinura amula* Cope; Mexico.
 11. *Scolecophis atrocinctus* Duméril and Bibron; Central America.
 12. *Tantilla melanocephala* Schlegel; Brazil.
 13. *Pogonaspis ruficeps* Cope; Costa Rica.
 14. *Cladophis kirtlandii* Hallowell; West Africa.
 15. *Tragops latus* Cope; Further India.
 16. *Orybelis acuminata* Wiedmann; Central America.

PLATE 29.

Hemipenes of *Proteroglypha* and *Platysera*.

- Fig. 1. *Dendraspis jamesonii* Traill (*Amphis hammondi* Hallowell); West Africa.
 2. *Acanthophis antarctica* Shaw; Australia.
 3. *Sepedon hamachates* Merrem; South Africa.
 4. *Bungarus semifasciatus* Kuhl; India.
 5. *Adenophis divirgatus* Schlegel; Siam.
 6. *Hoplocephalus coronatus* Schlegel; Australia.
 7. *Elaps corallinus* Linnæus; Central America.
 8. *Elaps surinamensis* Cuvier; Brazil.
 9. *Vermicella annulata* Gray; Australia.
 10. *Hydrophis hardwickii* Gray; Siam.

PLATE 30.

Hemipenes of *Proteroglypha*, *Platysera*, and *Solenoglypha*.

- Fig. 1. *Diemenia annulata* Buchholtz and Peters; West Africa.
 2. *Ophiophagus benyurus* Schlegel; Malacca.
 3. *Elaps imperator* Cope; Ecuador.
 4. *Hydrophis stokesii* Gray; Singapore.
 5. *Hydrus bicolor* Shaw; Pacific Ocean.
 6. *Brachycranium corpulentum* Hallowell; West Africa.
 7. *Causus rhombeatus* Lichtenstein; Central Africa.
 8. *Cophias atrox* Linnæus; Nicaragua.
 9. *Bothriopsis affinis* Bocourt; Mexico.
 10. *Crotalus molossus* Baird and Girard; Arizona.

PLATE 31.

Hemipenes of *Solenoglypha*.

- Fig. 1. *Clotho rhinocerus* Schlegel; Gaboon.
 2. *Vipera aspis* Linnæus; Italy.
 3. *Cerastes aegyptiacus* Linnæus.
 4. *Ancistrodon contortrix* Linnæus; New York.
 5. *Ancistrodon piscivorus* Linnæus; Florida.
 6. *Cophias alternatus* Duméril and Bibron; Brazil.
 7. *Orphryacus undulatus* Jan; Mexico.
 8. *Crotalophorus catenatus* Rafinesque; Michigan.
 9. *Crotalus horridus* Linnæus; Pennsylvania.
 10. *Crotalus basiliscus* Cope; Mexico.
 11. *Crotalus durissus* Linnæus; Brazil; young.

PLATE 32.

Variations in marking on Snakes.

- Fig. 1. *Ophibolus doliatus triangulus*.
 2. *Ophibolus doliatus clericus*.

PLATE 33.

Variations in marking on Snakes.

- Fig. 3. *Ophibolus doliatus collaris*.
4. *Ophibolus doliatus temporalis*.

PLATE 34.

Variations in marking on Snakes.

- Figs. 5, 6. *Ophibolus doliatus doliatus*.

PLATE 35.

Variations in marking on Snakes.

- Fig. 7. *Ophibolus doliatus sypilus*.
8. *Ophibolus doliatus parallelus*.

PLATE 36.

Variations in marking on Snakes.

- Fig. 9. *Ophibolus doliatus annulatus*.
10. *Ophibolus doliatus coccineus*.

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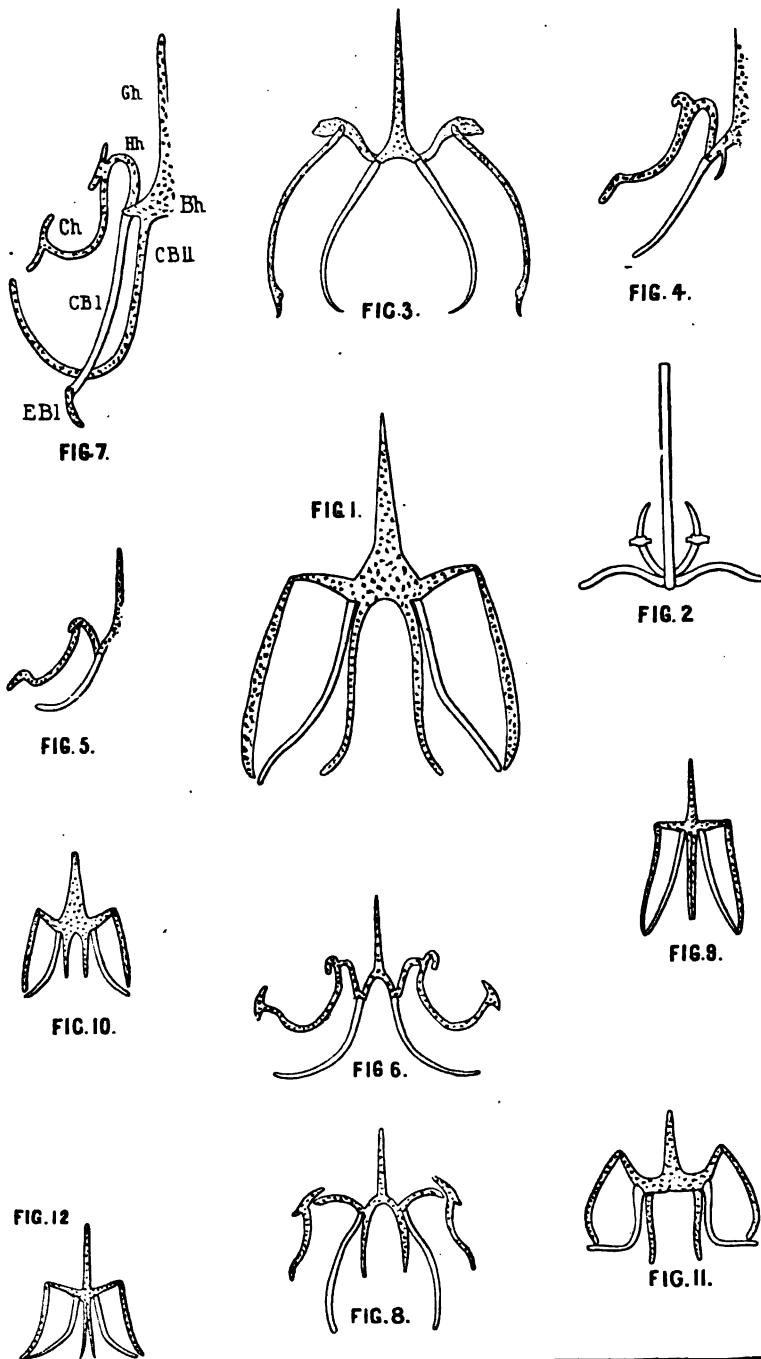
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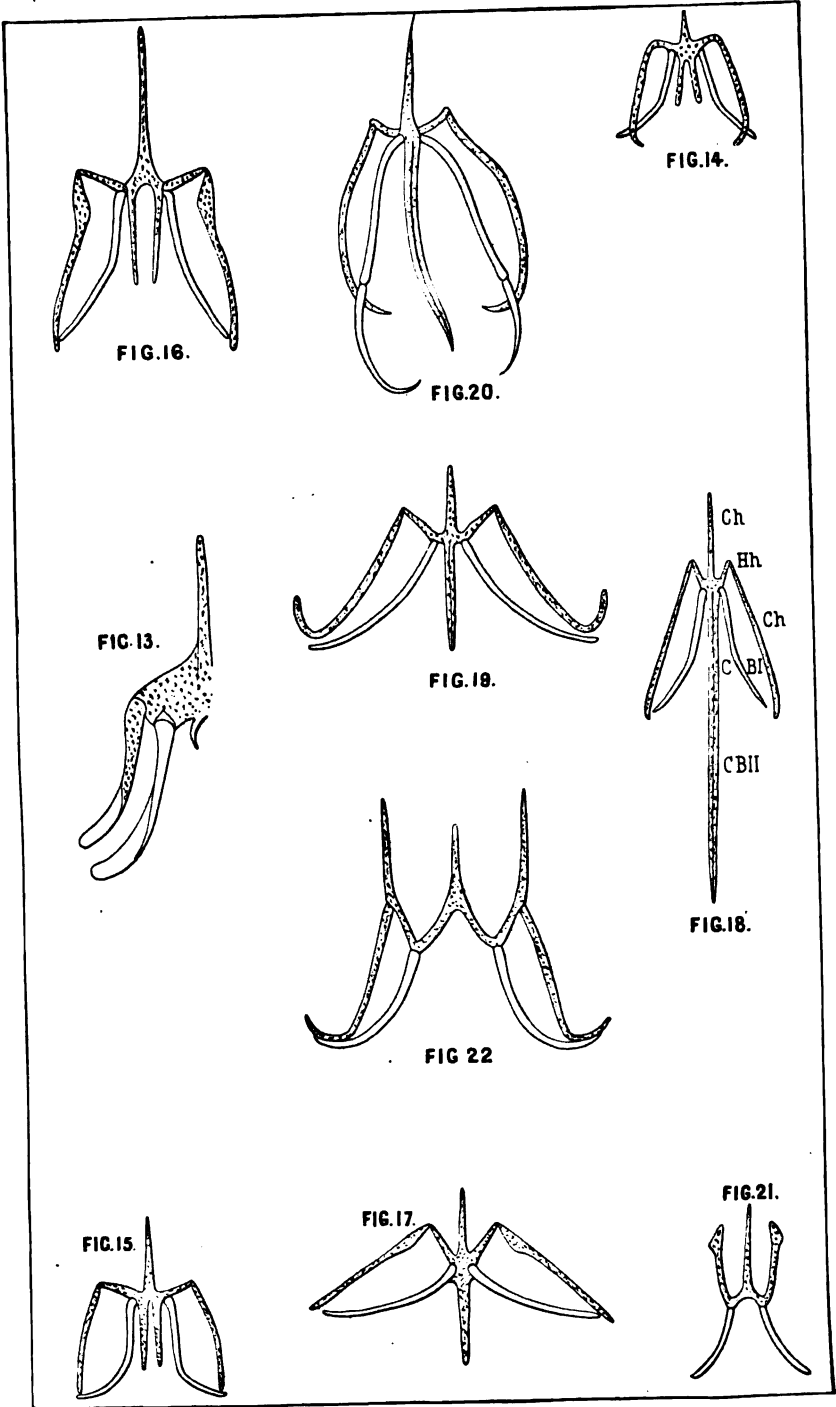
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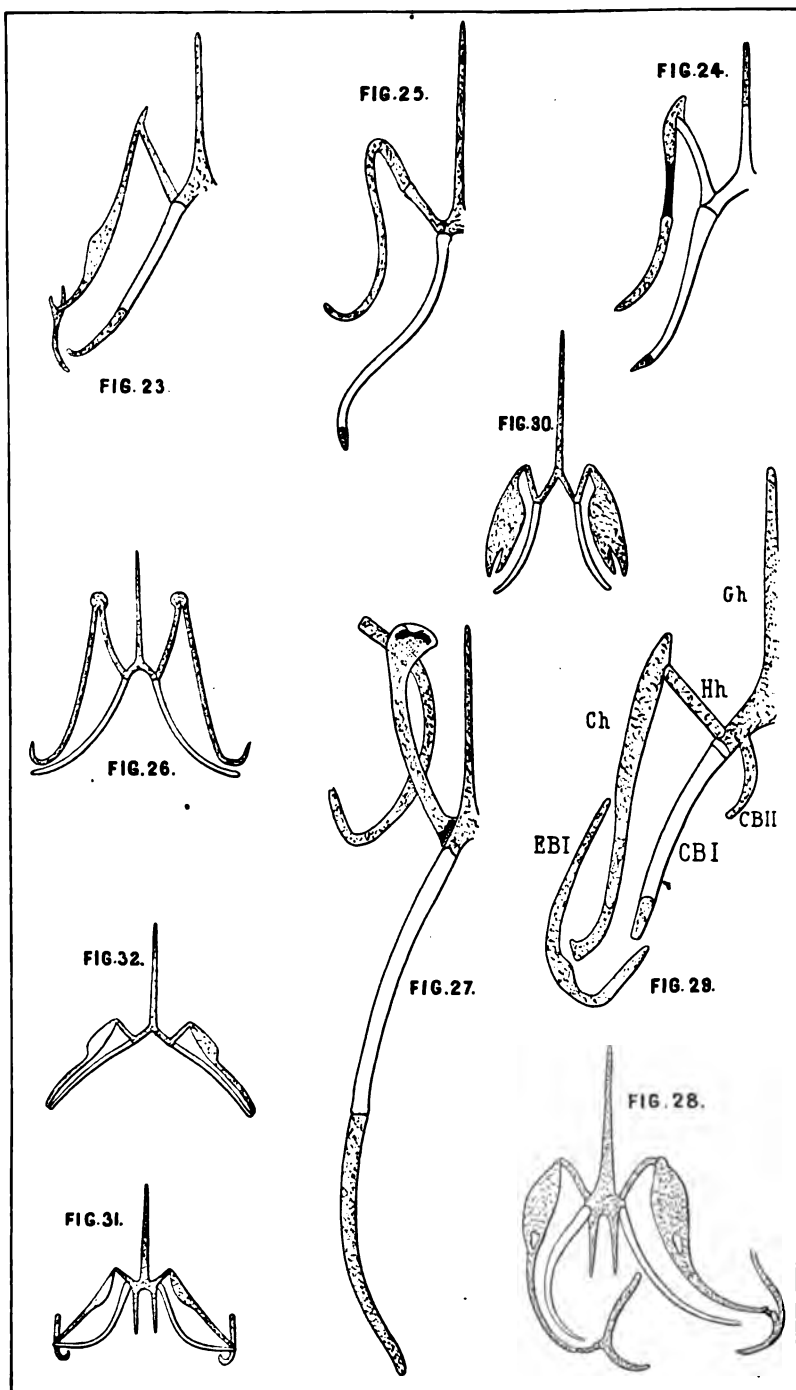
HYOID BONES OF SAURIA RHIPTOGLOSSA AND ACRODONTA.

FOR EXPLANATION OF PLATE SEE PAGE 1235.



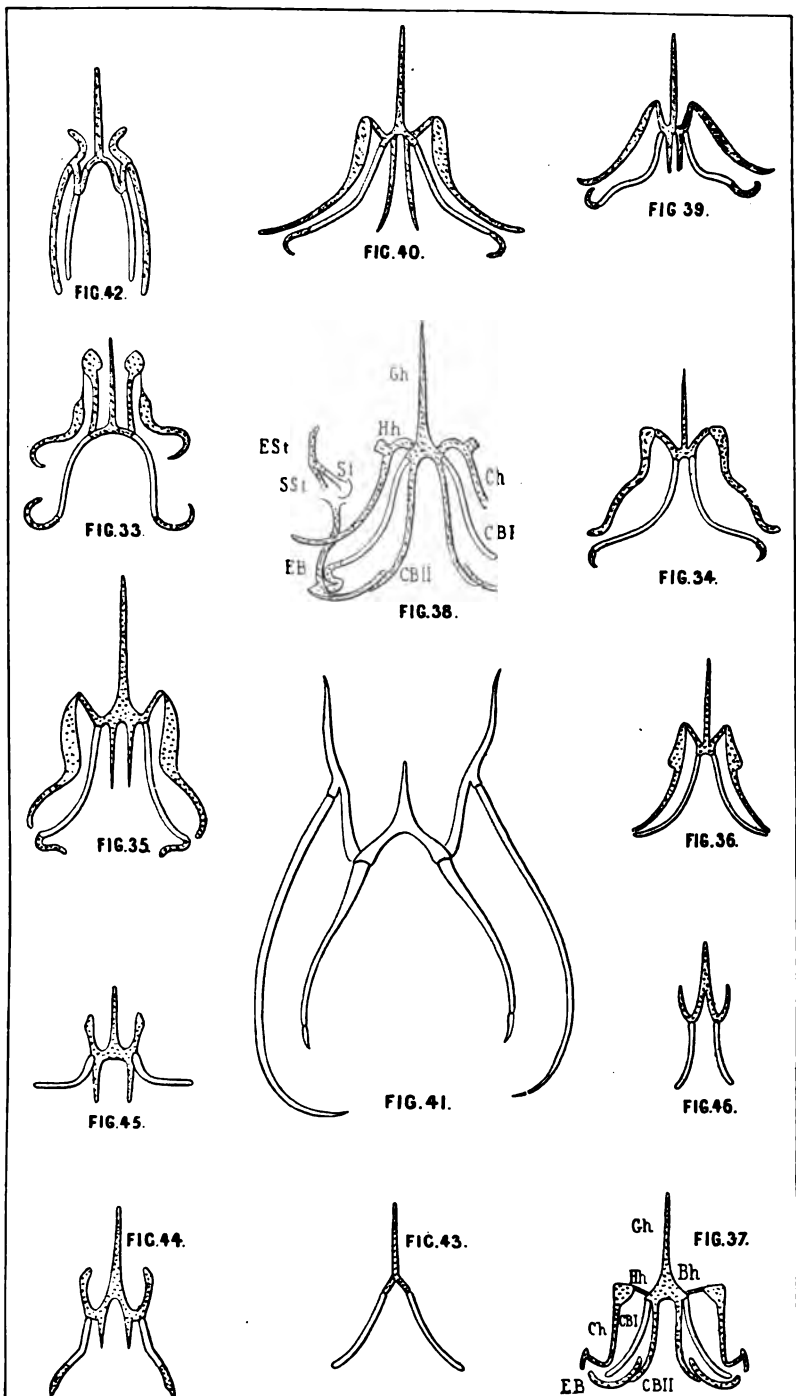
HYOID BONES OF SAURIA IGUANIA AND DIPLOGLOSSA.

FOR EXPLANATION OF PLATE SEE PAGE 1235.



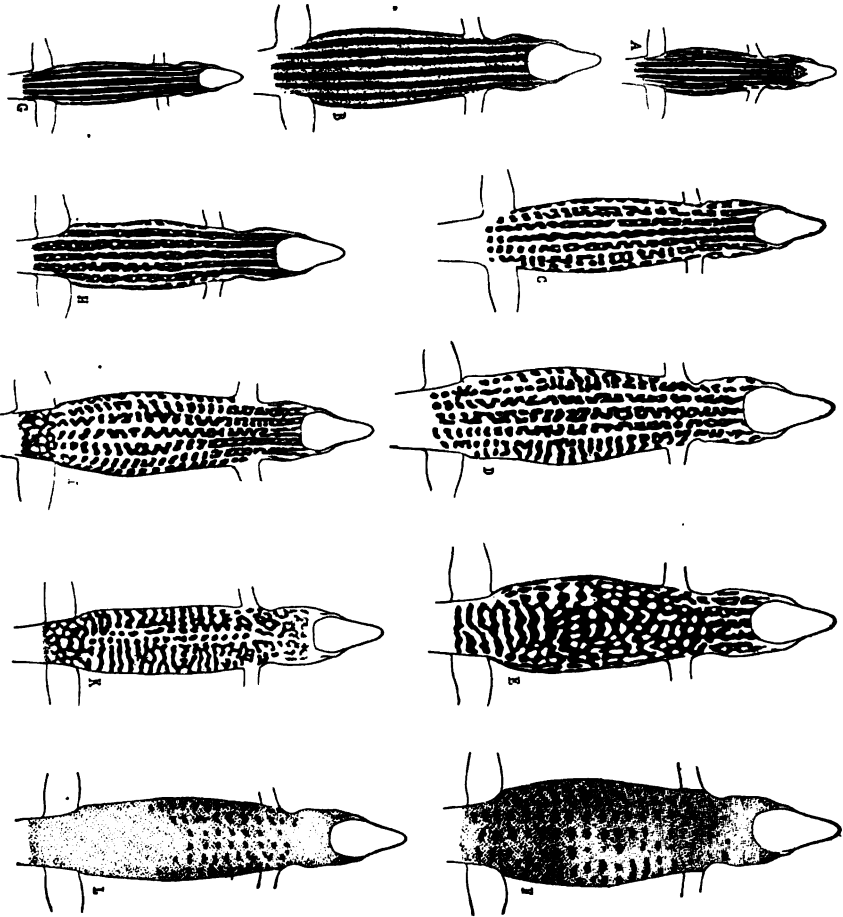
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FOR EXPLANATION OF PLATE SEE PAGES 1235, 1236.



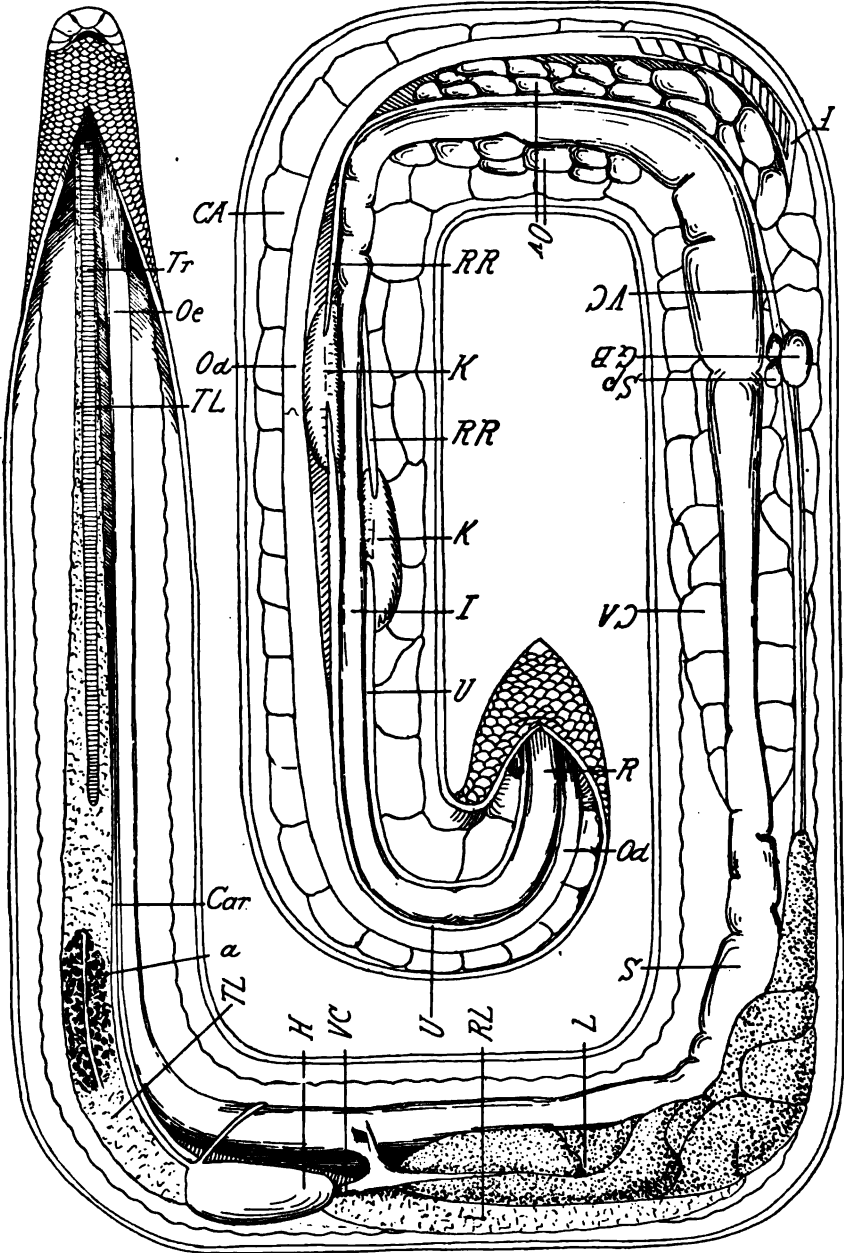
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FOR EXPLANATION OF PLATE SEE PAGE 1236.



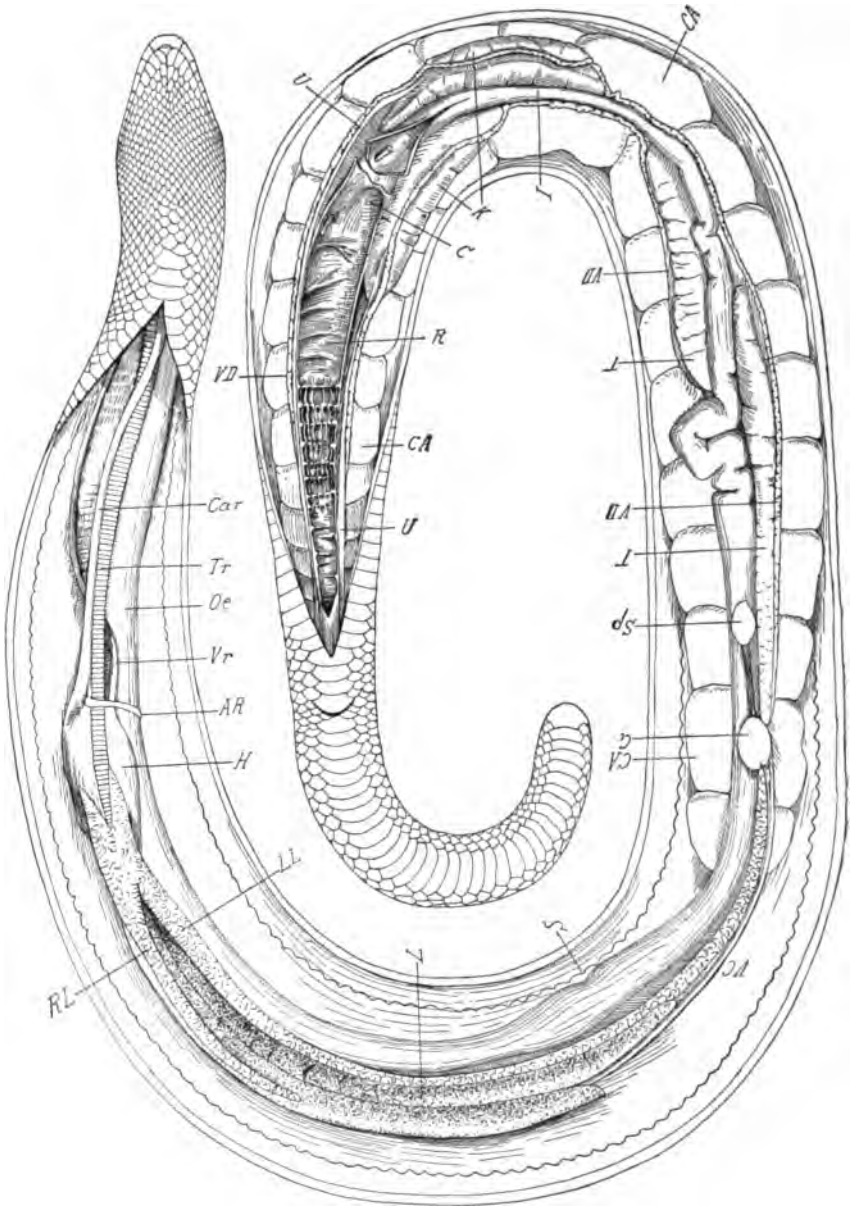
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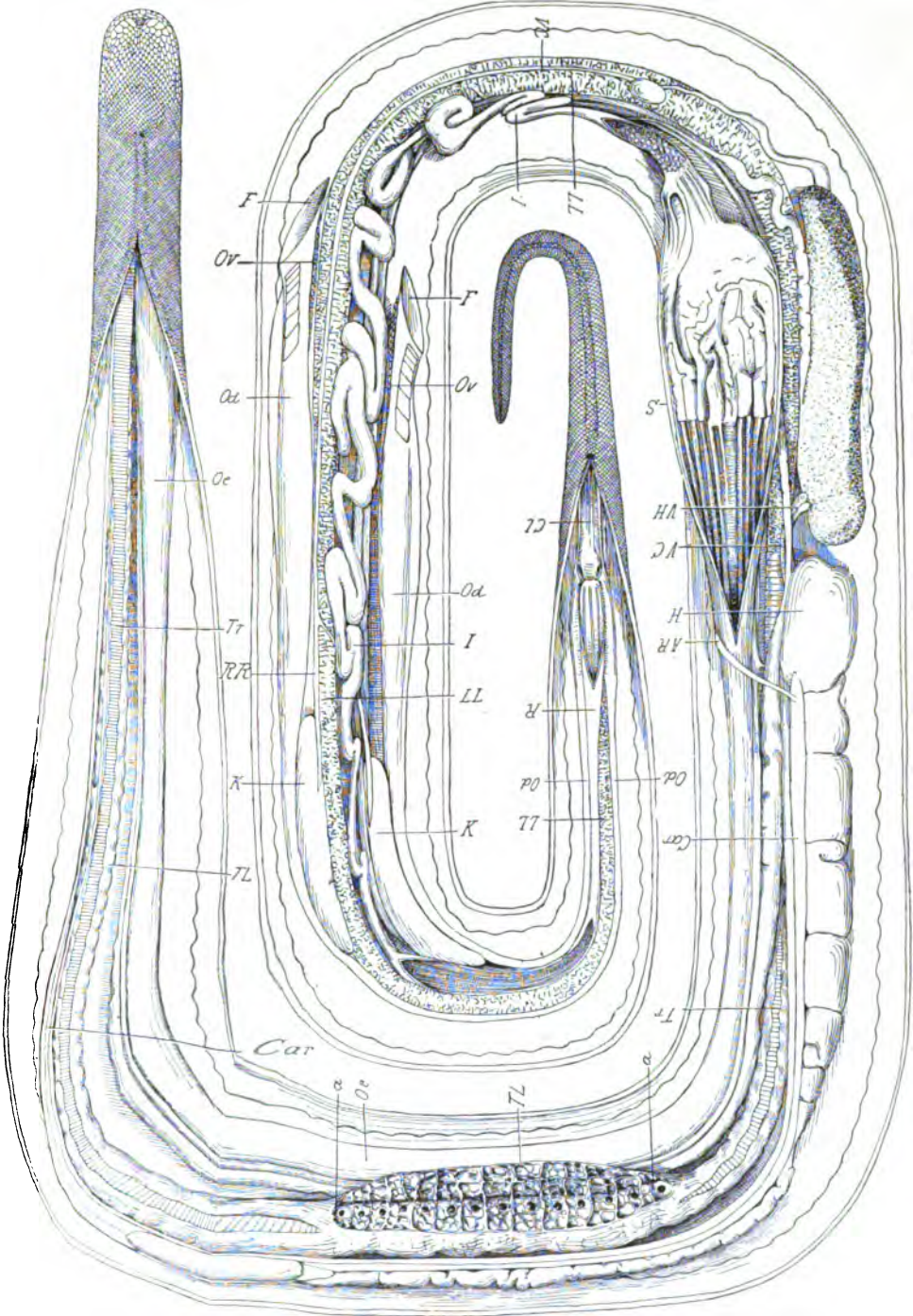
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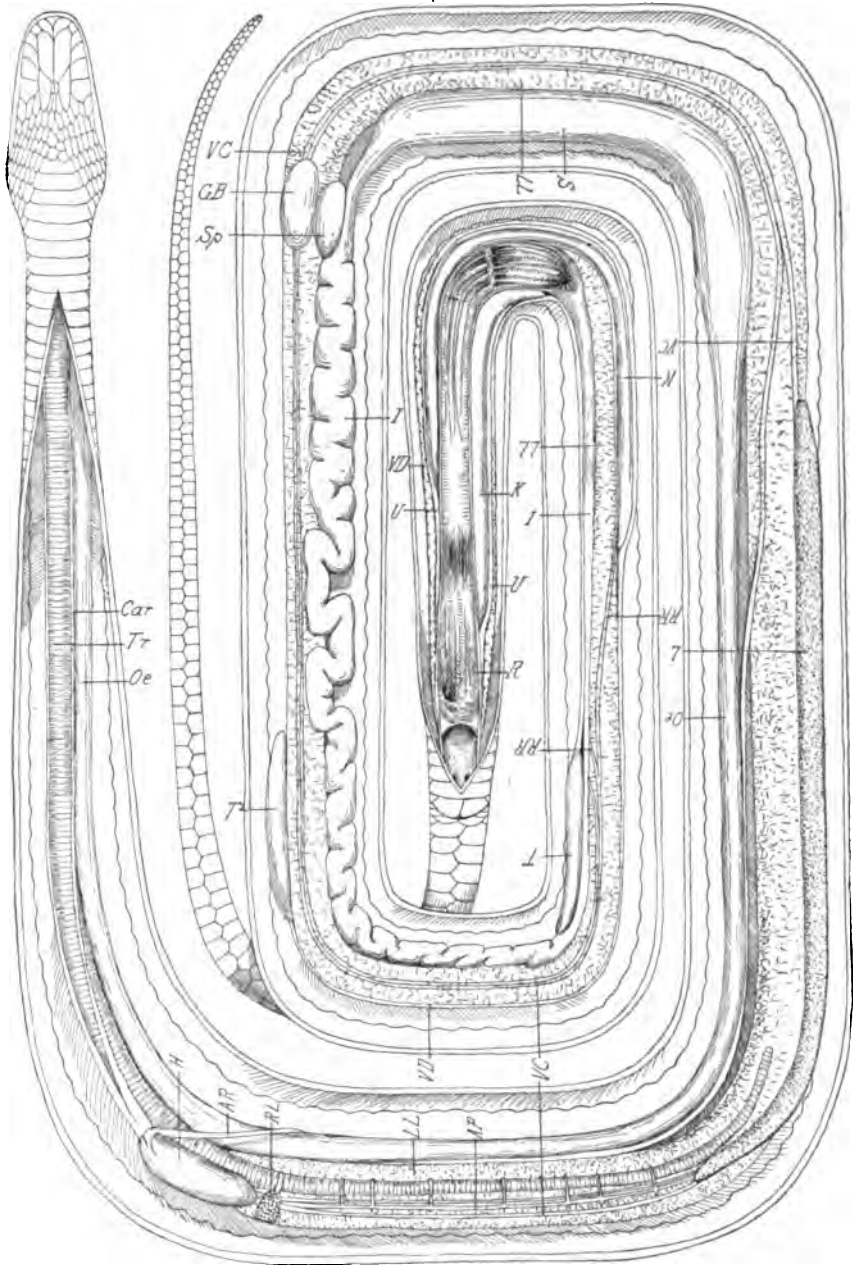
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FOR EXPLANATION OF PLATE SEE PAGE 1237.



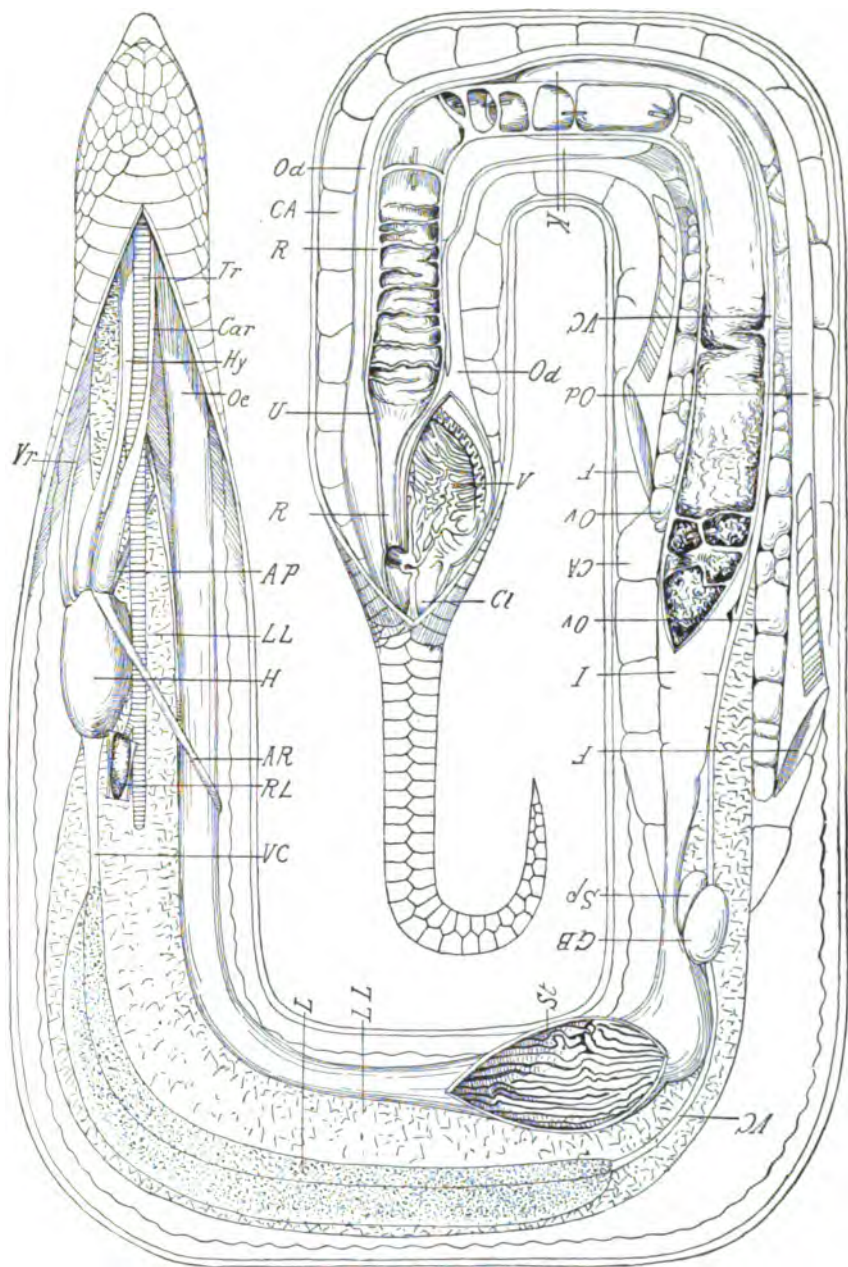
VISCERA OF *CHERSYDRUS GRANULATUS* MERREM.

FOR EXPLANATION OF PLATE SEE PAGE 1237.



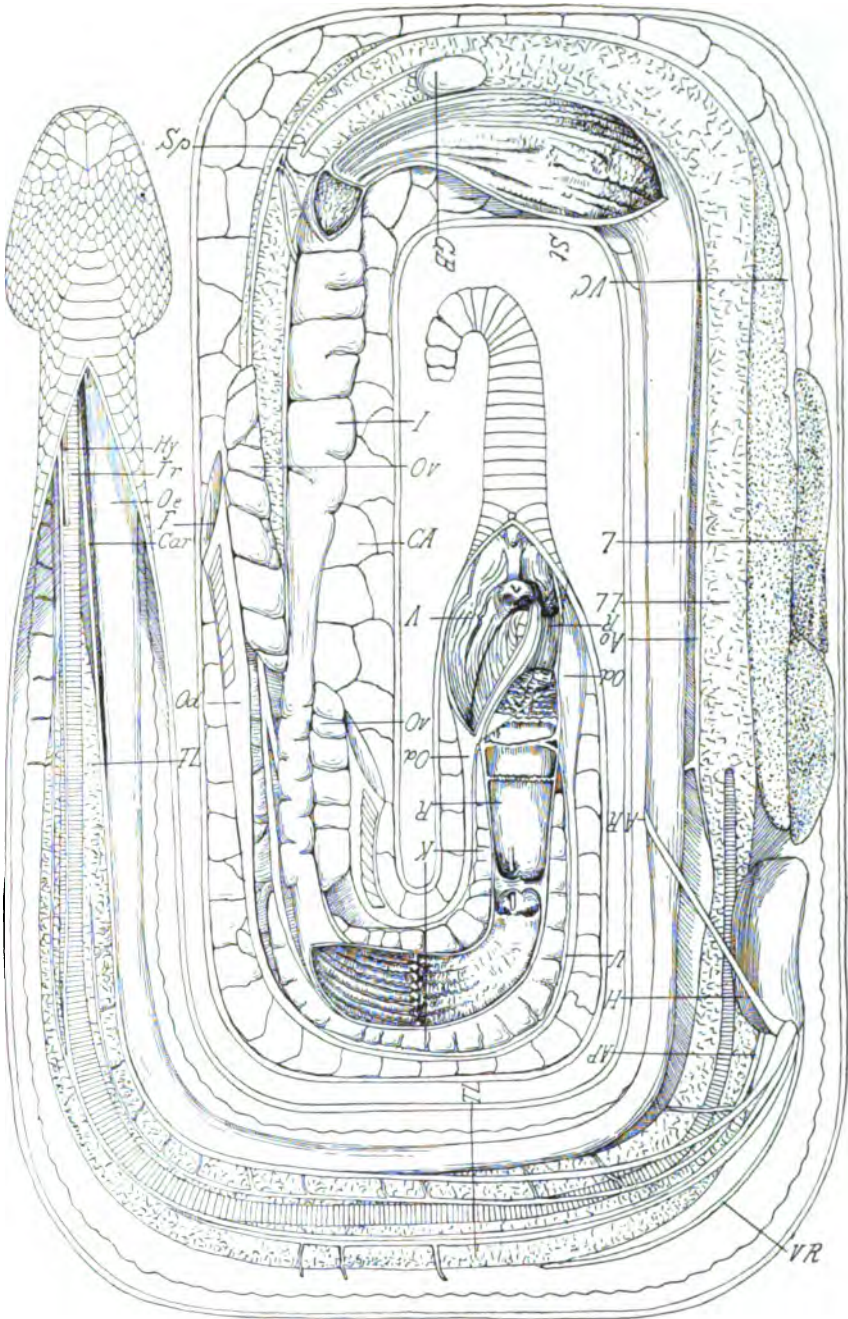
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FOR EXPLANATION OF PLATE SEE PAGE 1237.



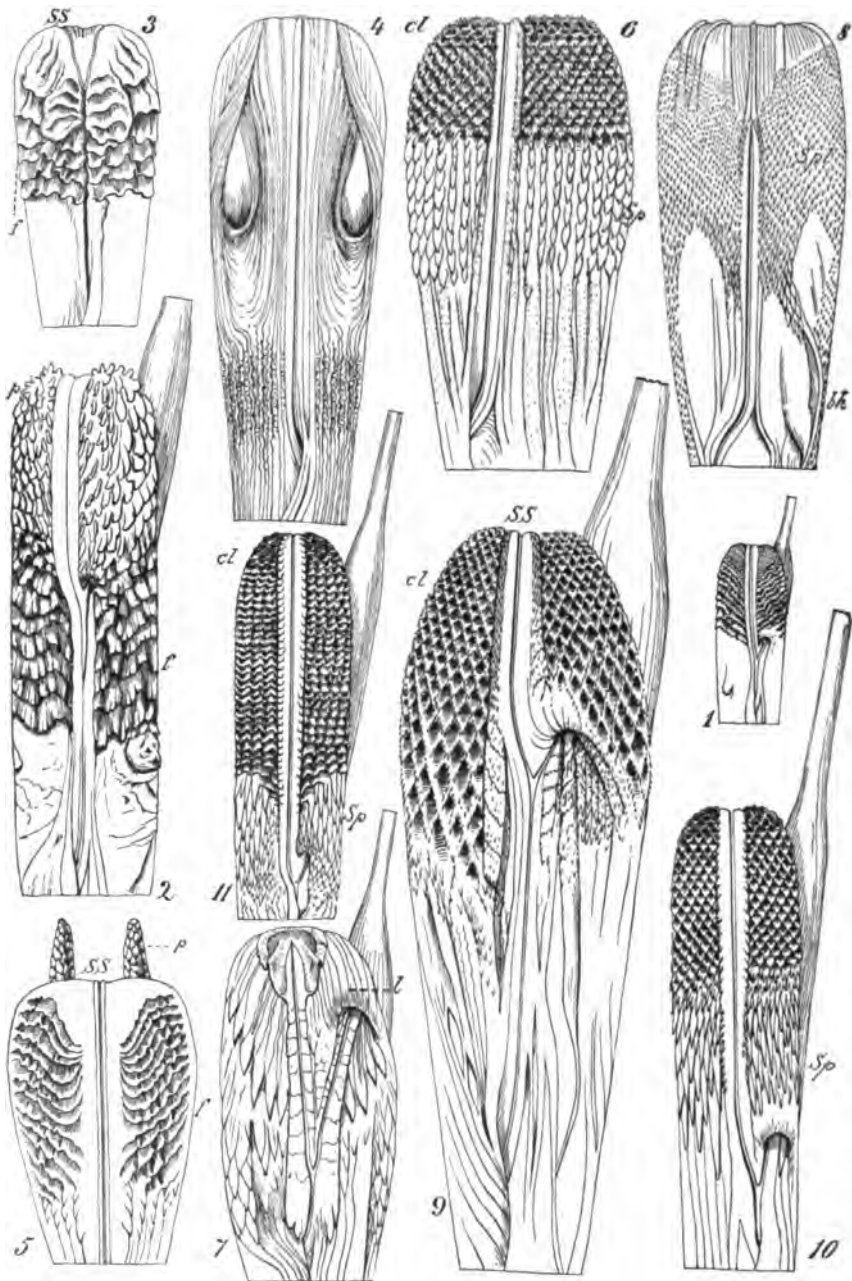
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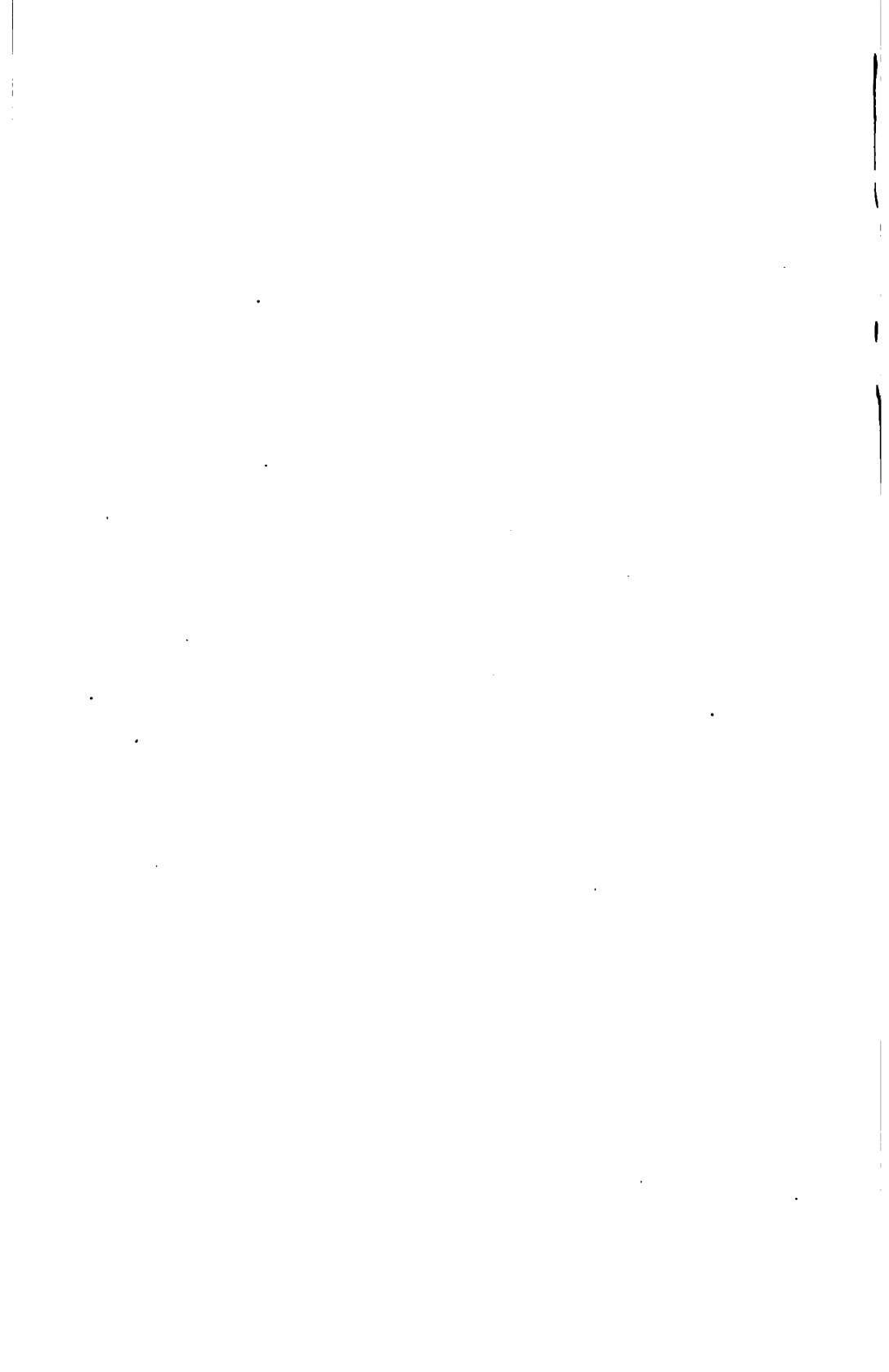
VISCERA OF *CROTALUS CONFLUENTUS* SAY.

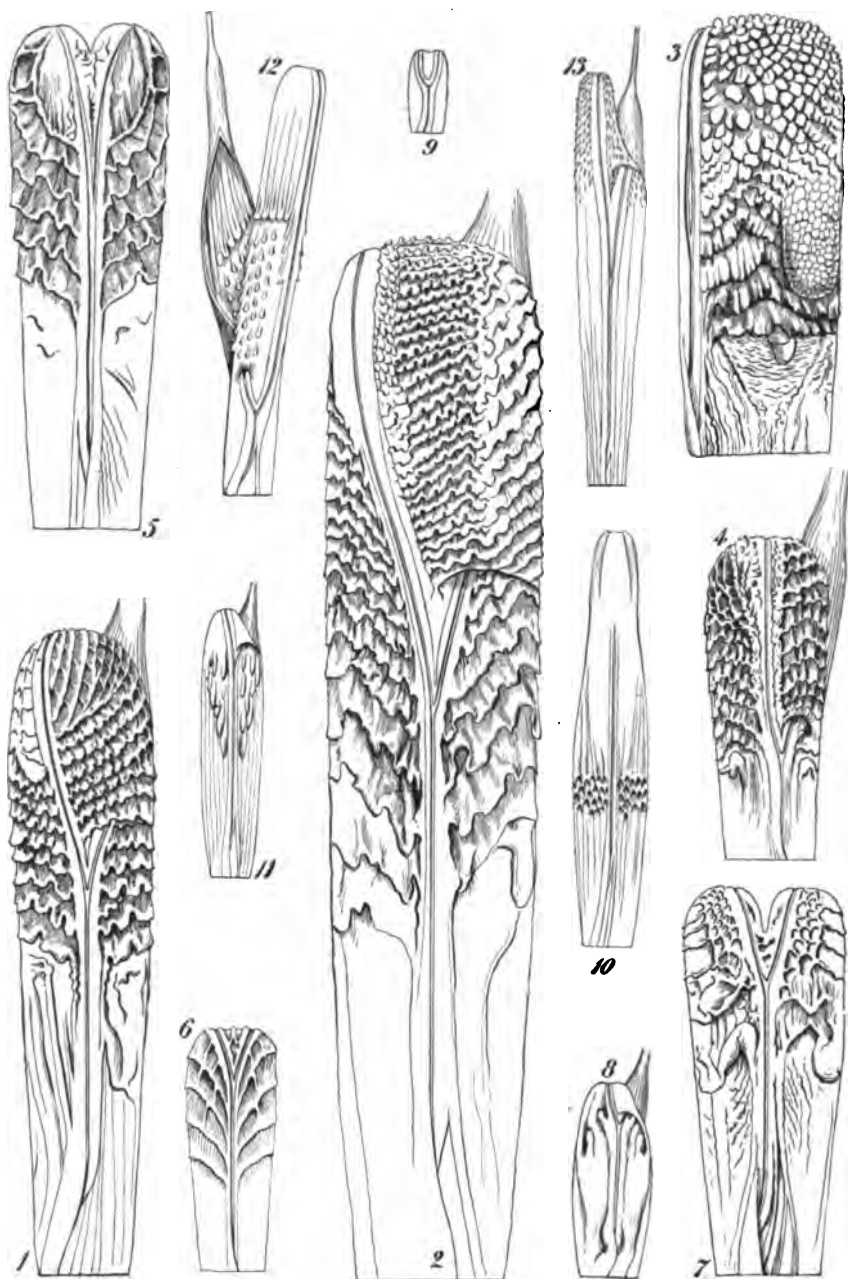
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HEMIPENES OF REPRESENTATIVE TYPES.

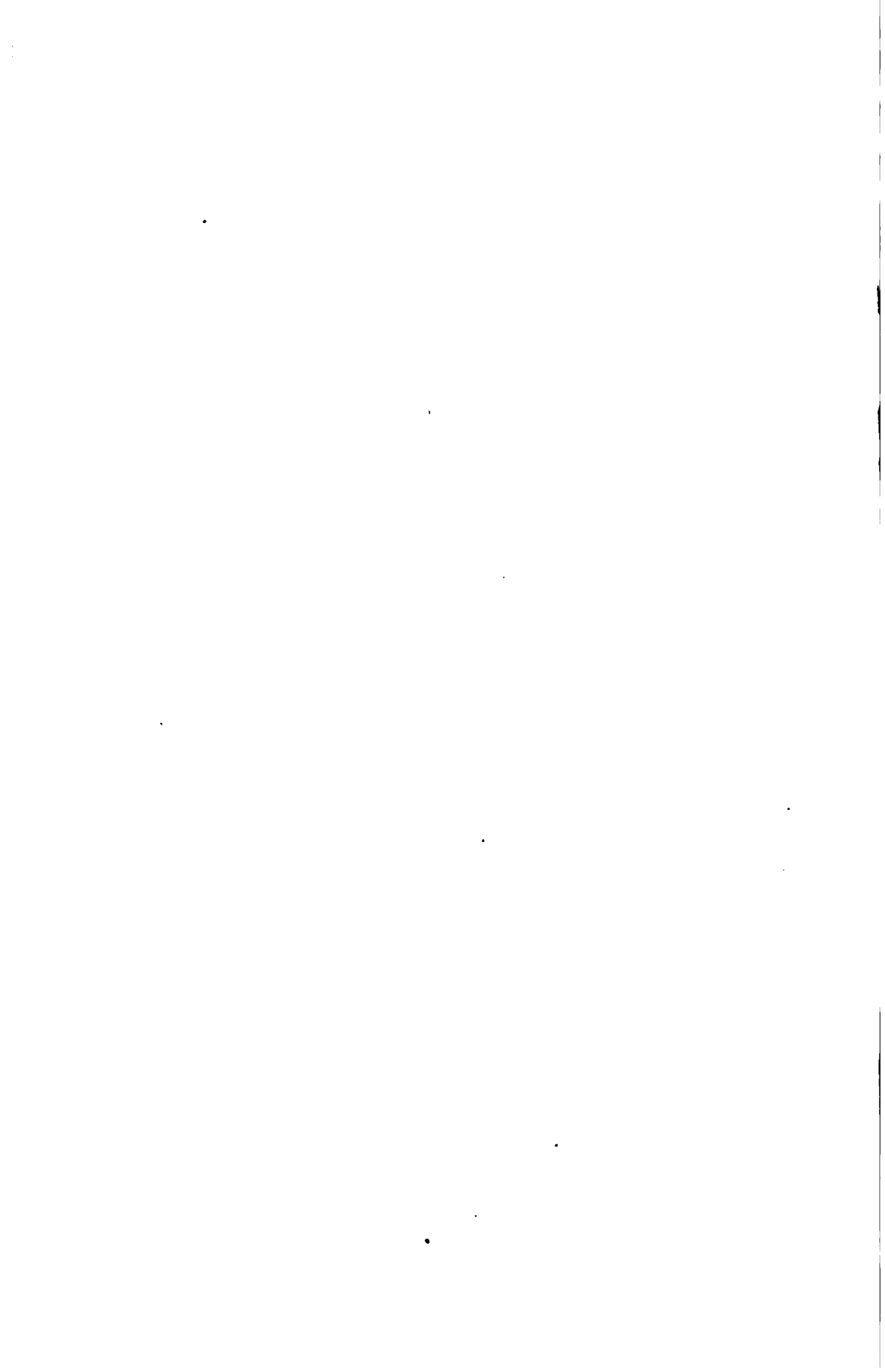
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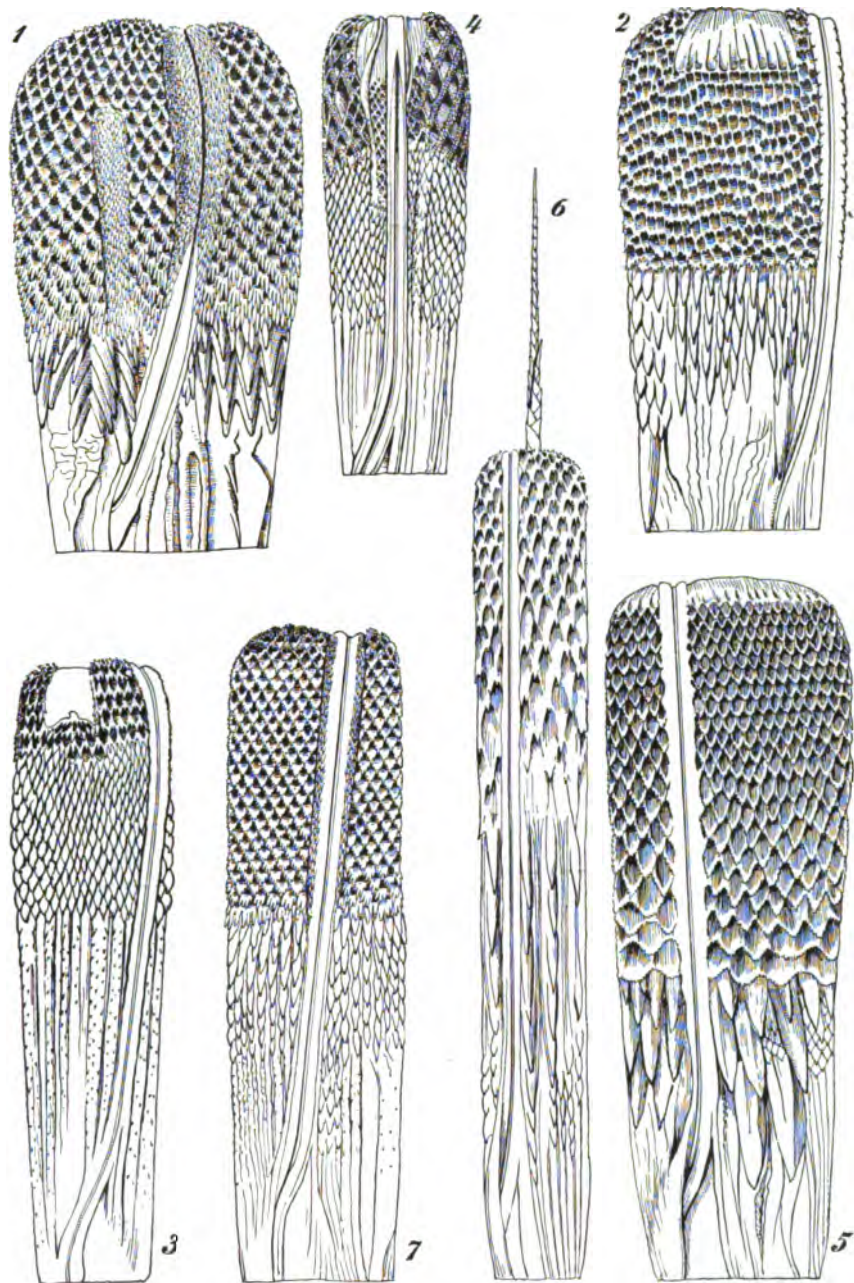




HEMIPENES OF PEROPODA, ACROCHORDIDÆ, AND CALAMARINÆ.

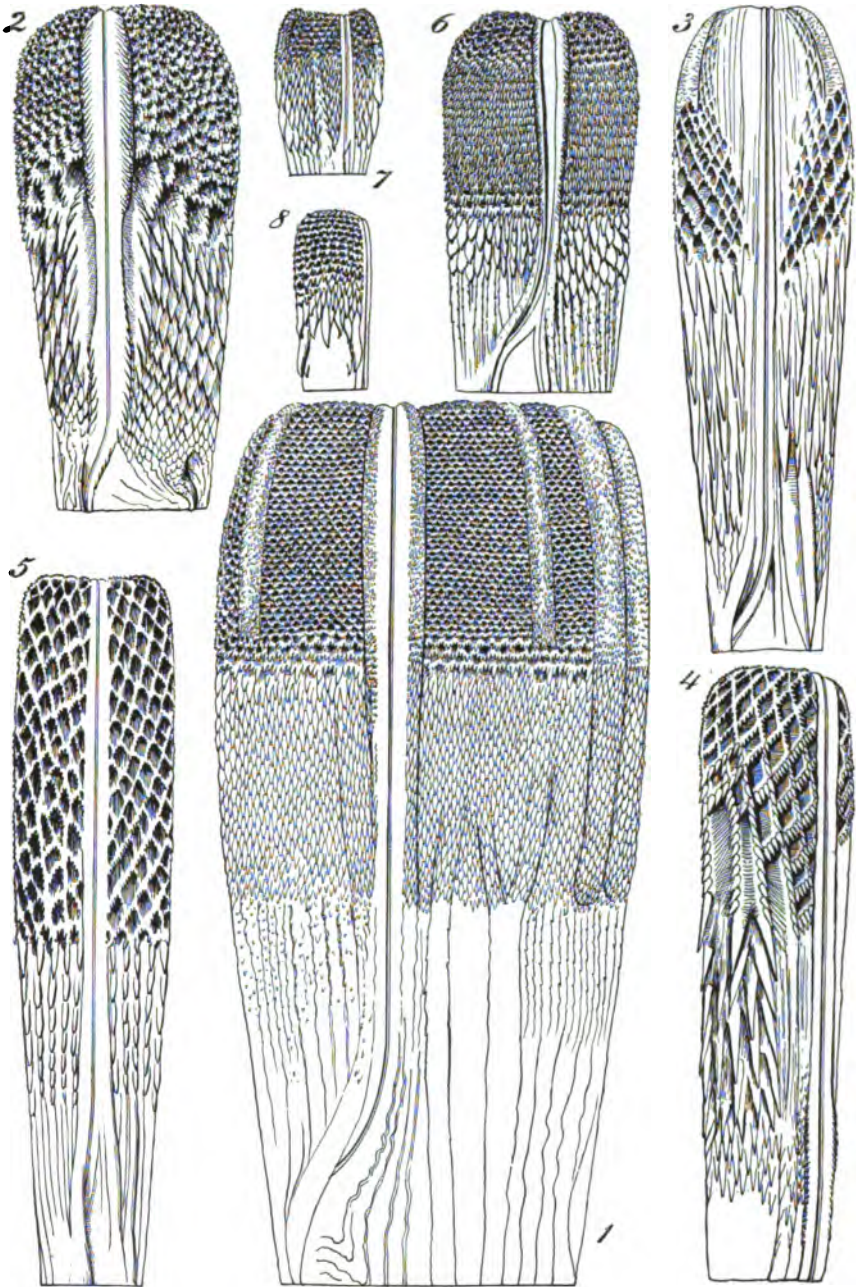
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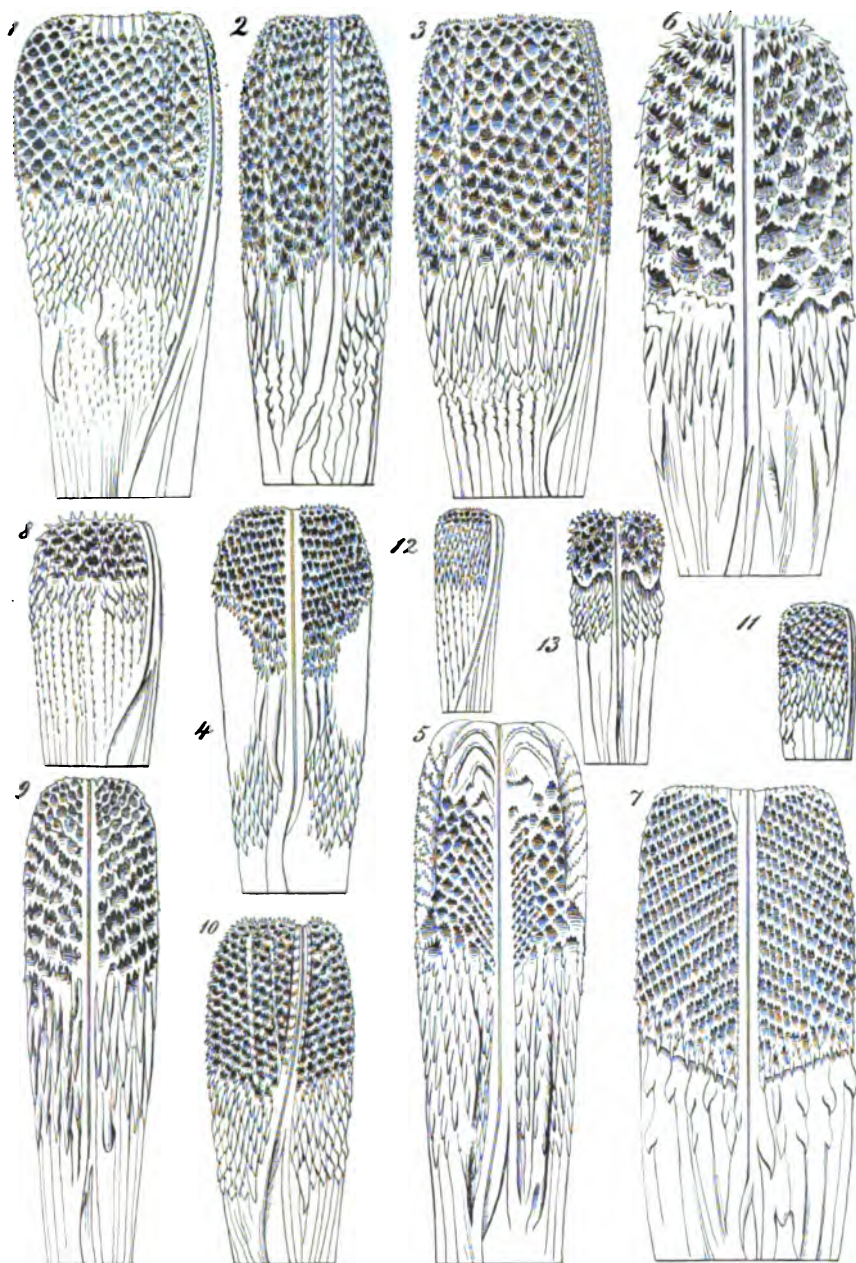
HEMIPENES OF COLUBRINÆ.

FOR EXPLANATION OF PLATE SEE PAGE 1238.



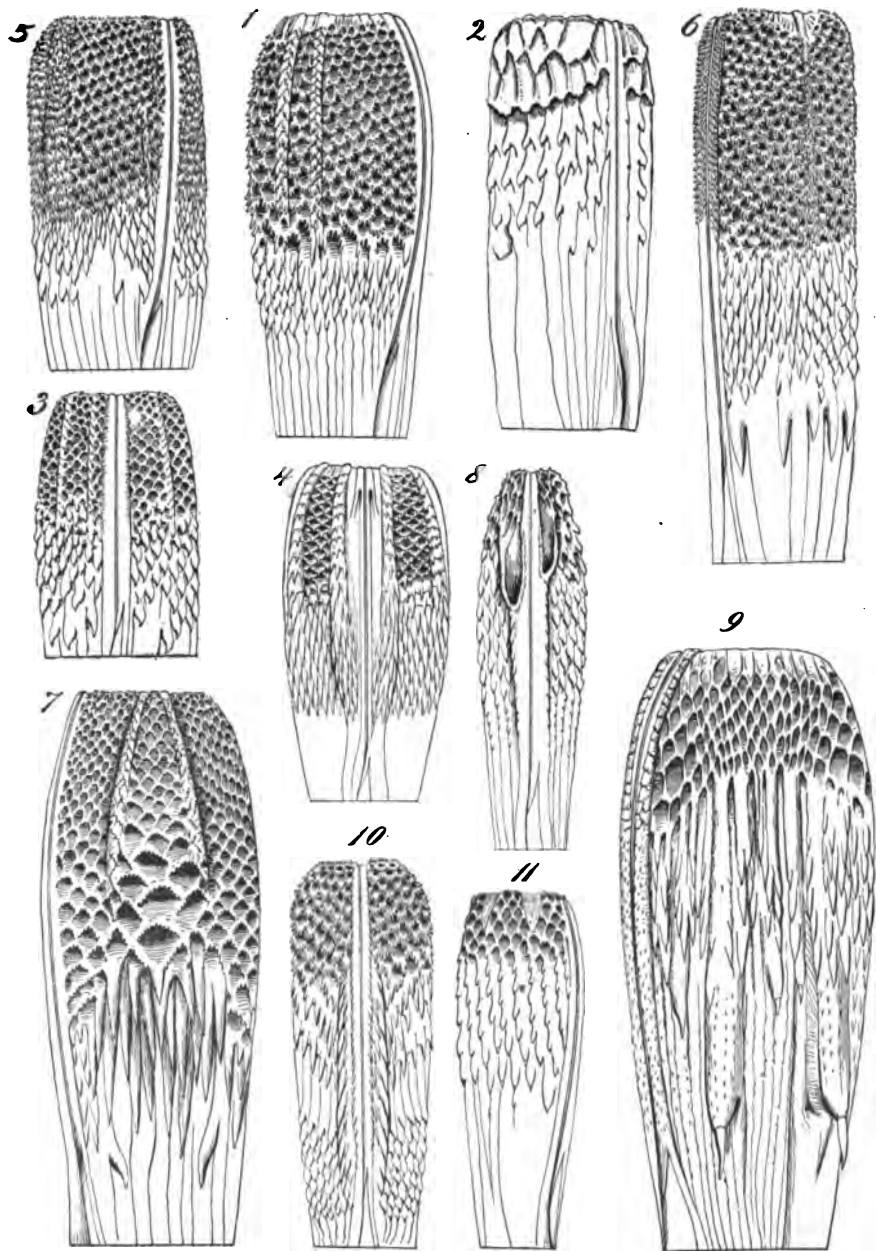
HEMIPENES OF COLUBRINÆ.

FOR EXPLANATION OF PLATE SEE PAGE 1238.



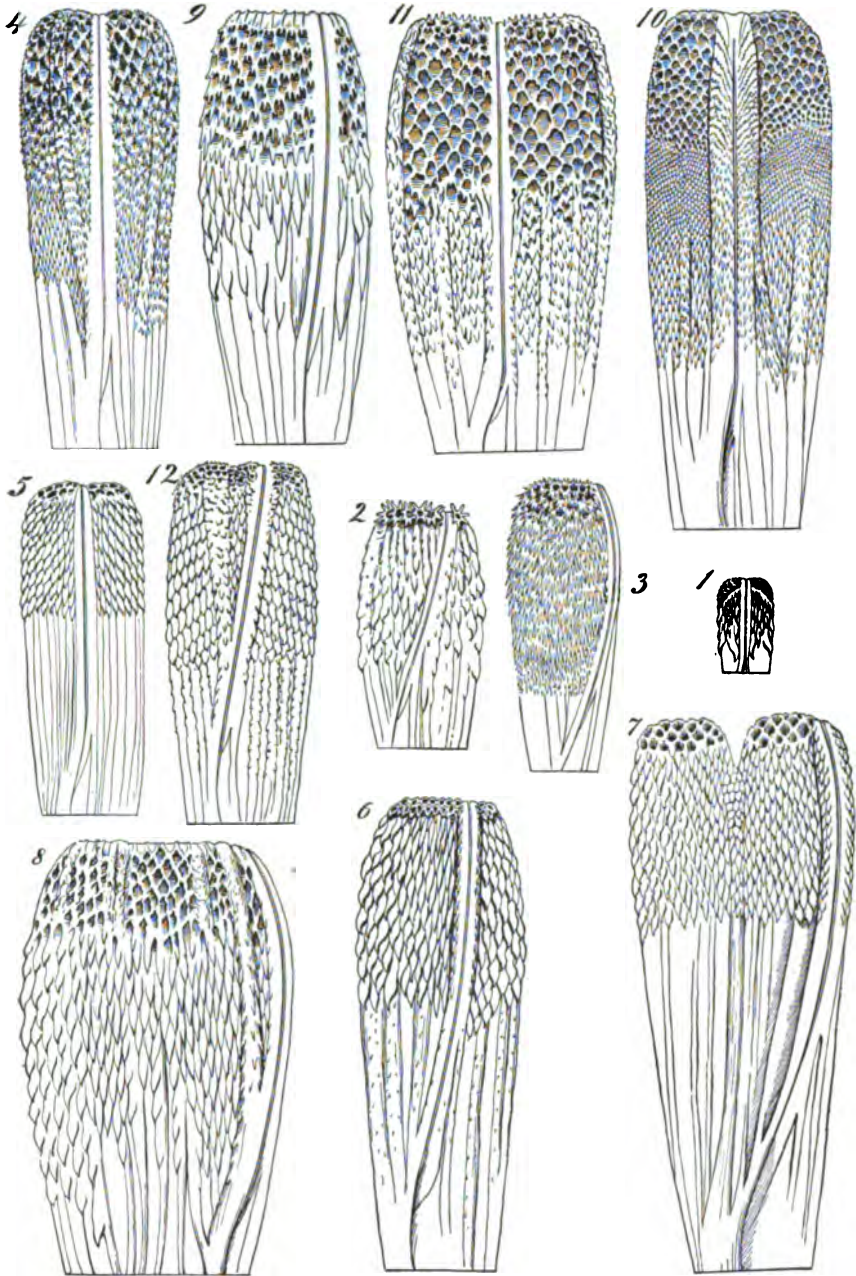
HEMIPENES OF COLUBRINÆ.

FOR EXPLANATION OF PLATE SEE PAGES 1238, 1239.

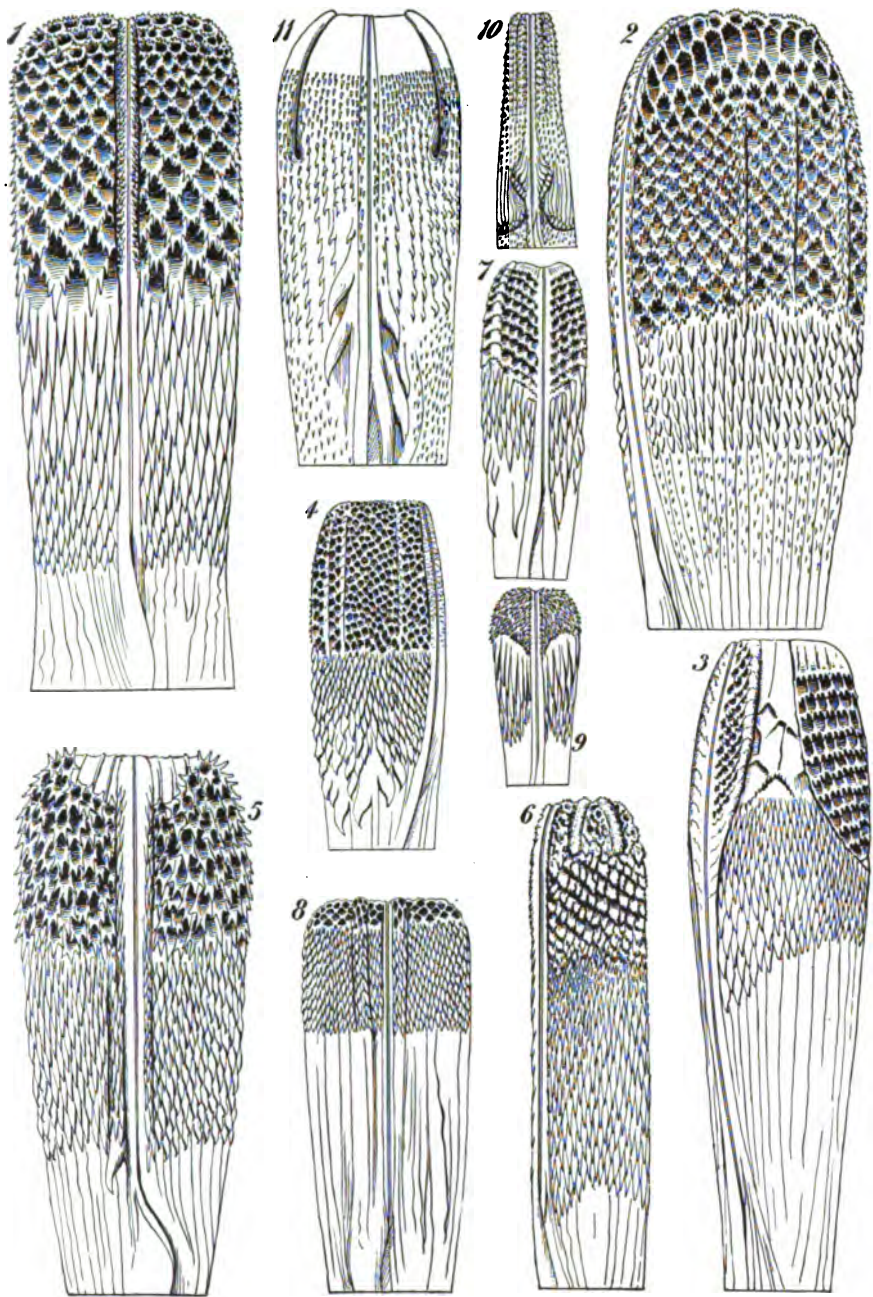


HEMIPENES OF COLUBRINÆ.

FOR EXPLANATION OF PLATE SEE PAGE 1239.

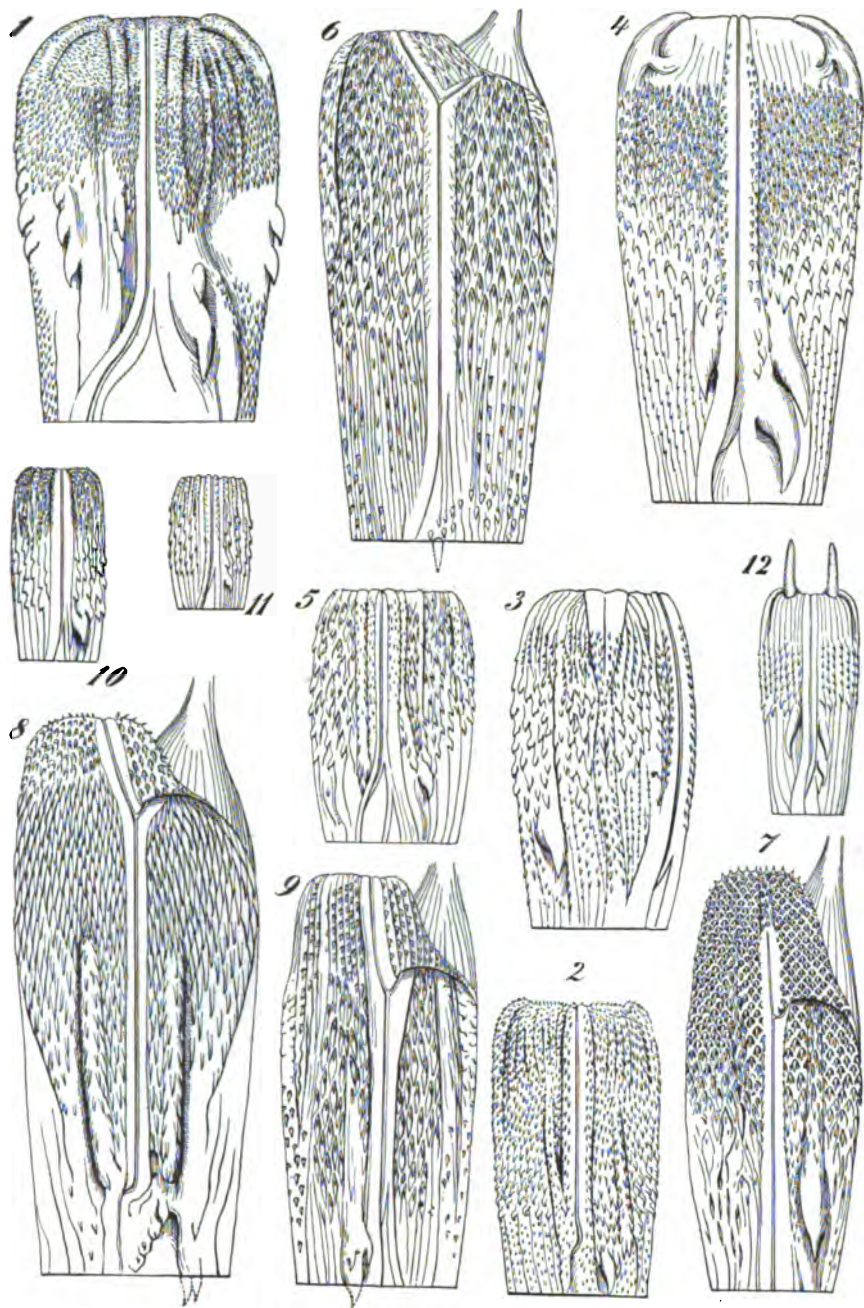


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FOR EXPLANATION OF PLATE SEE PAGE 1289.



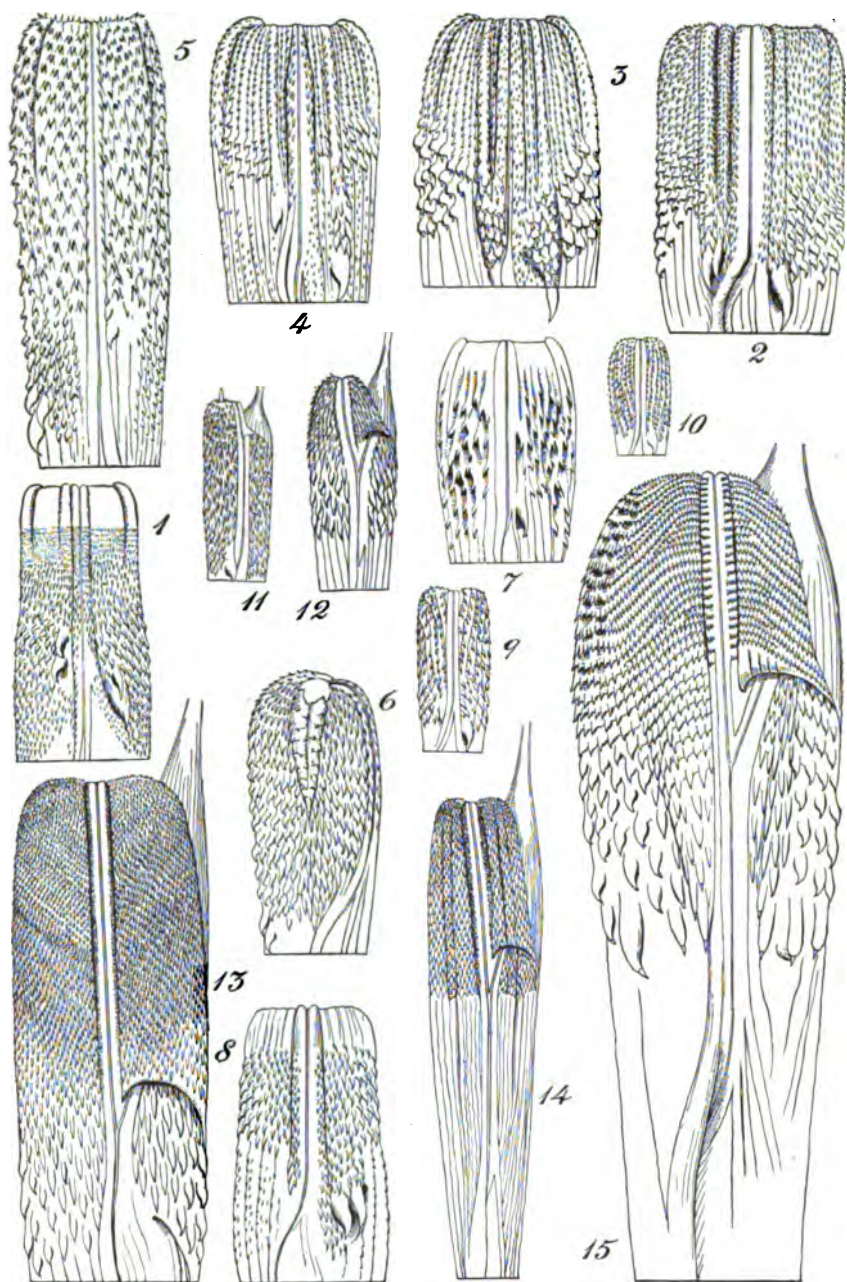
HEMIPENES OF COLUBRINÆ AND NATRICINÆ.

FOR EXPLANATION OF PLATE SEE PAGE 1239.



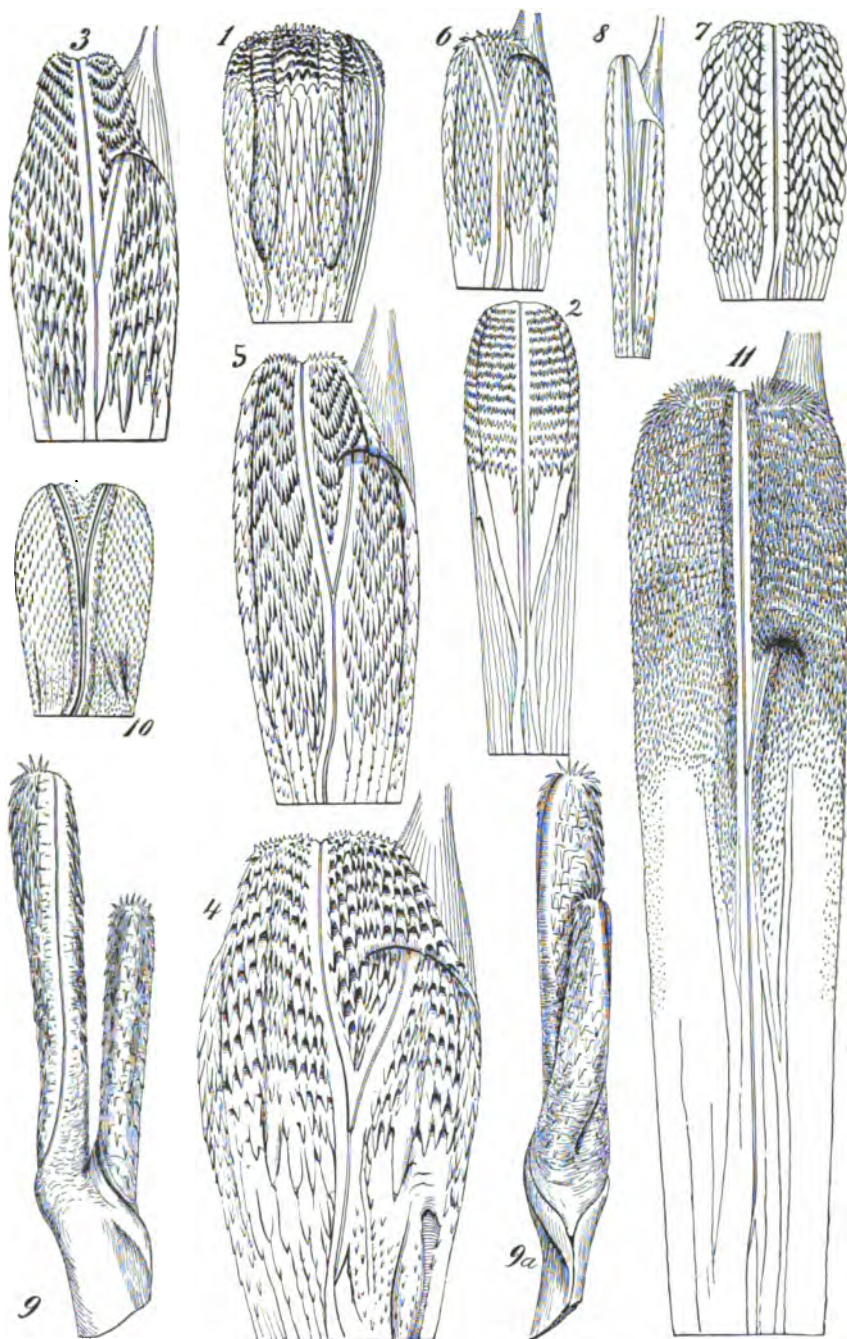
HEMIPENES OF NATRICINÆ.

FOR EXPLANATION OF PLATE SEE PAGE 1240.



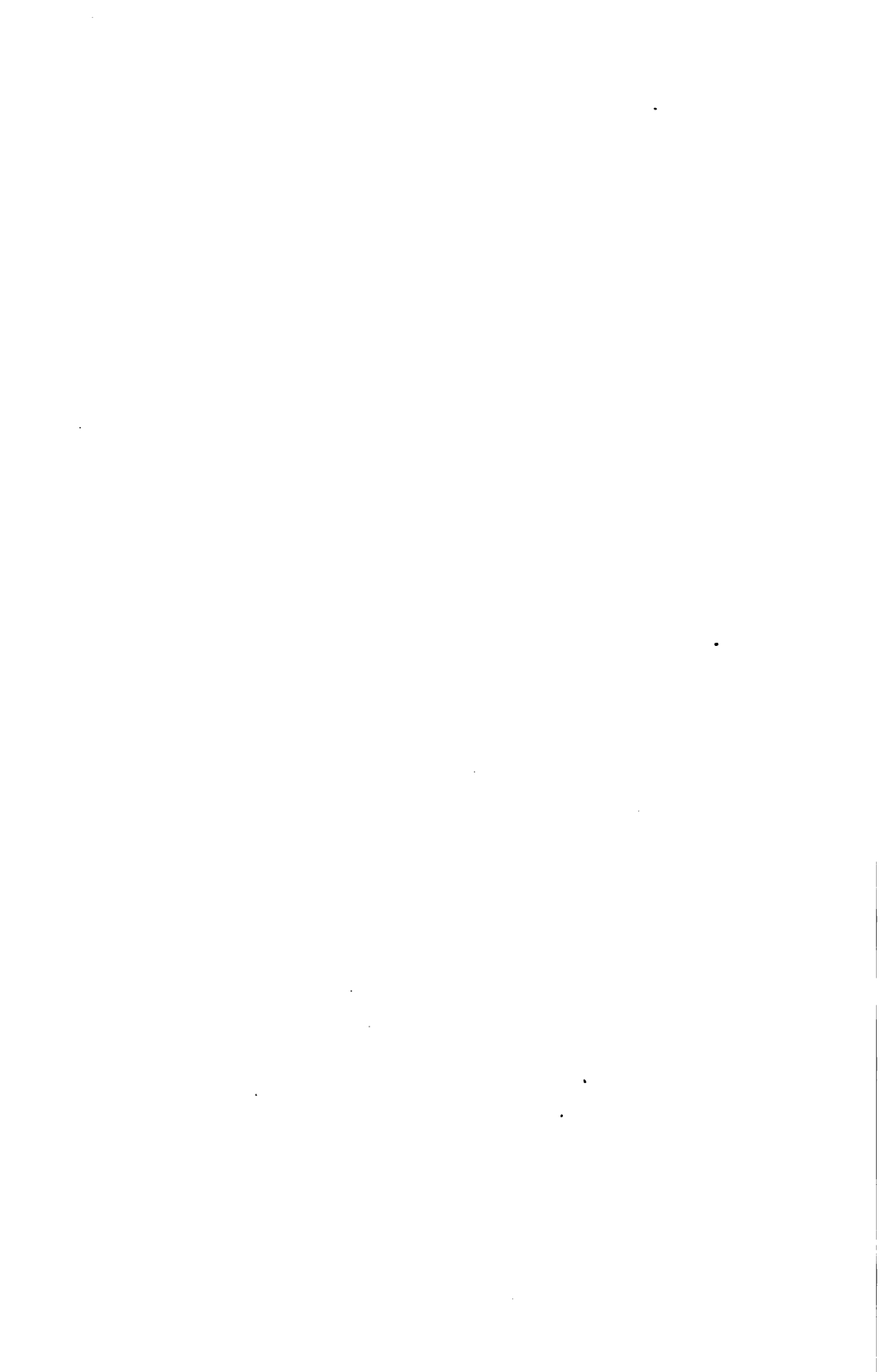
HEMIPENES OF NATRICINÆ AND HOMALOPSINÆ.

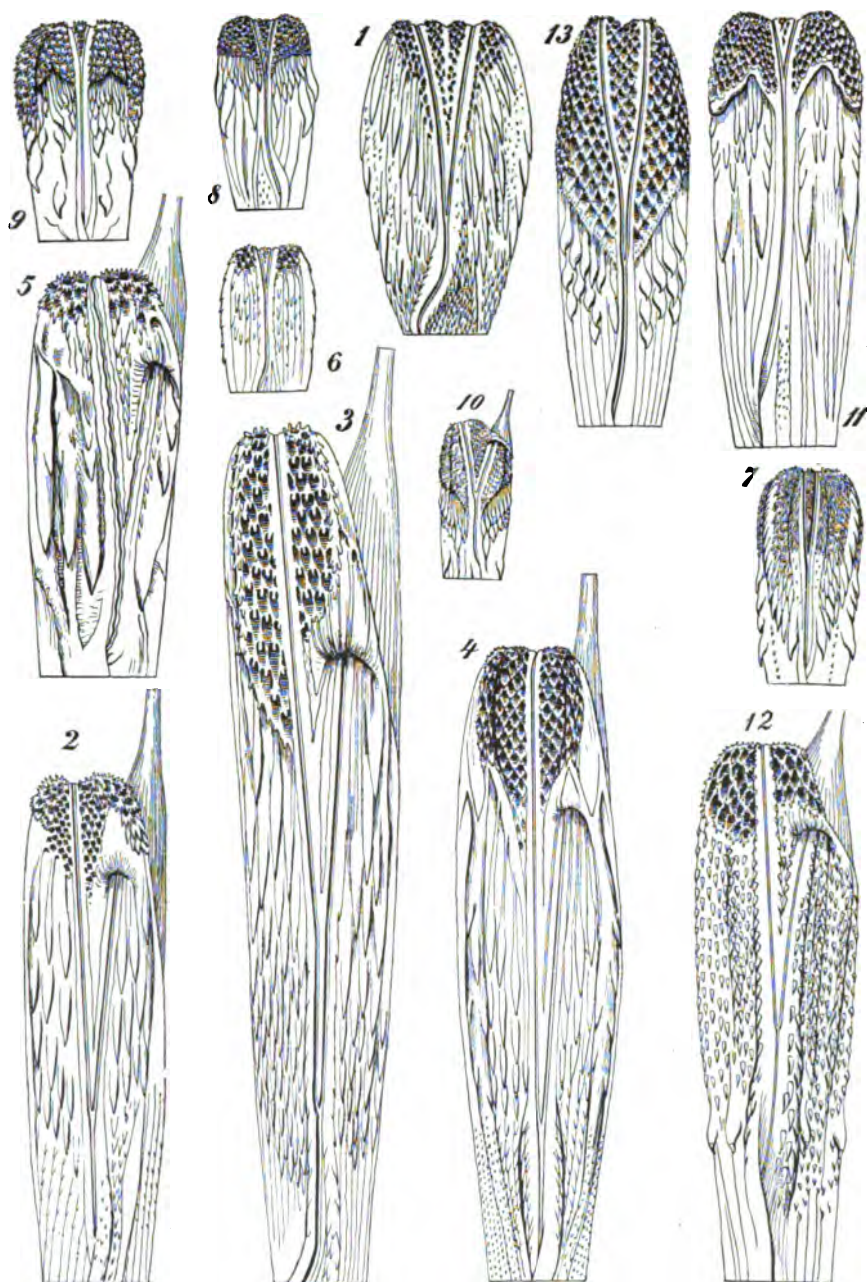
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HEMIPENES OF LYCODONTINÆ.

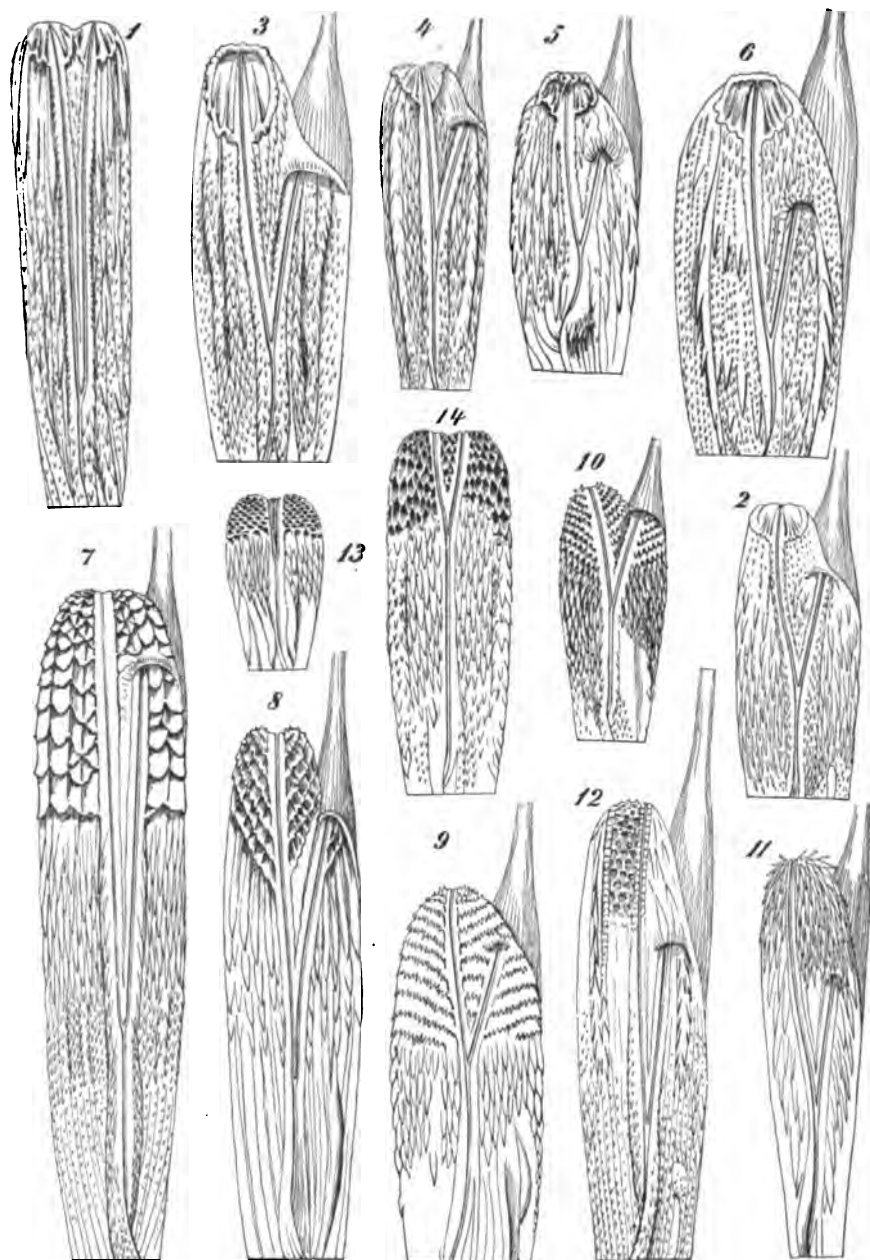
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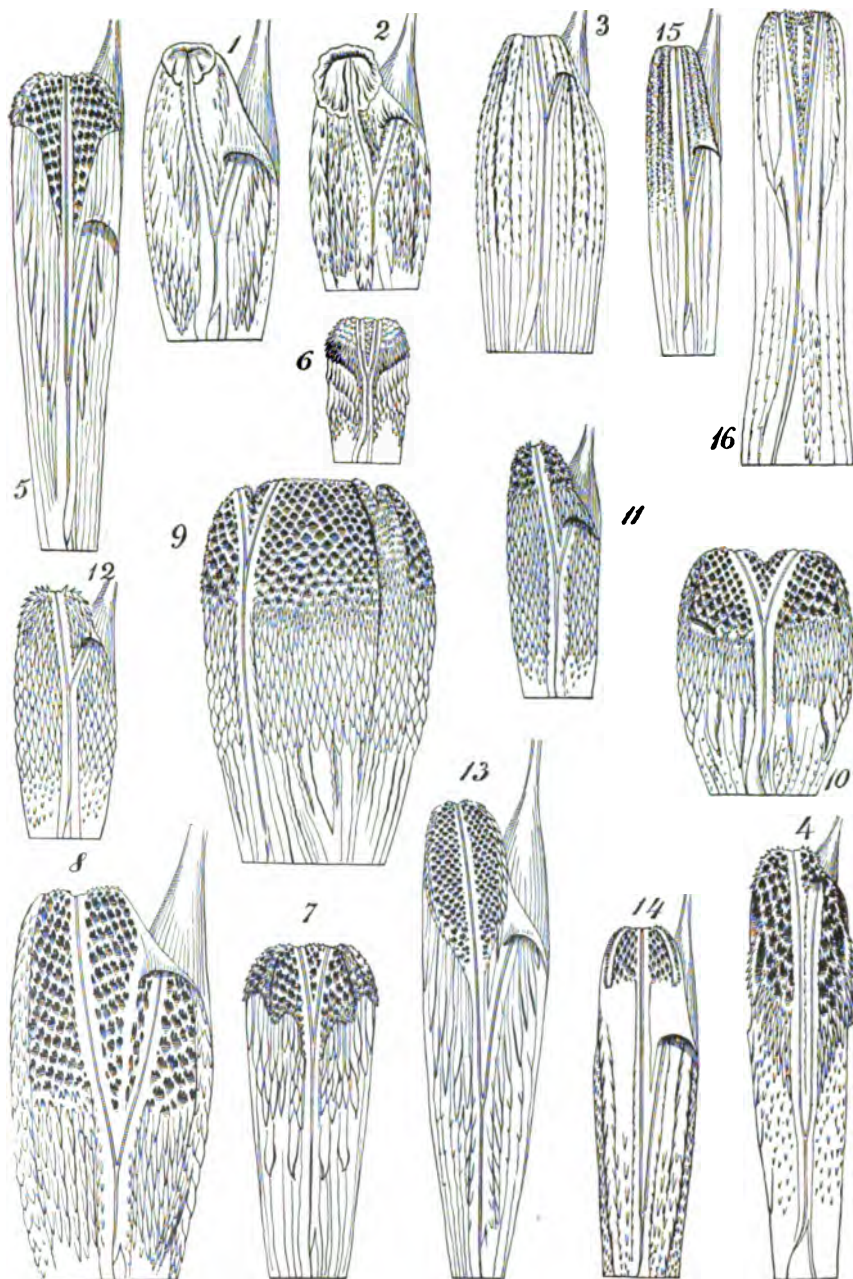
HEMIPENES OF DROMICINÆ AND LEPTOGNATHINÆ.

FOR EXPLANATION OF PLATE SEE PAGE 1241.



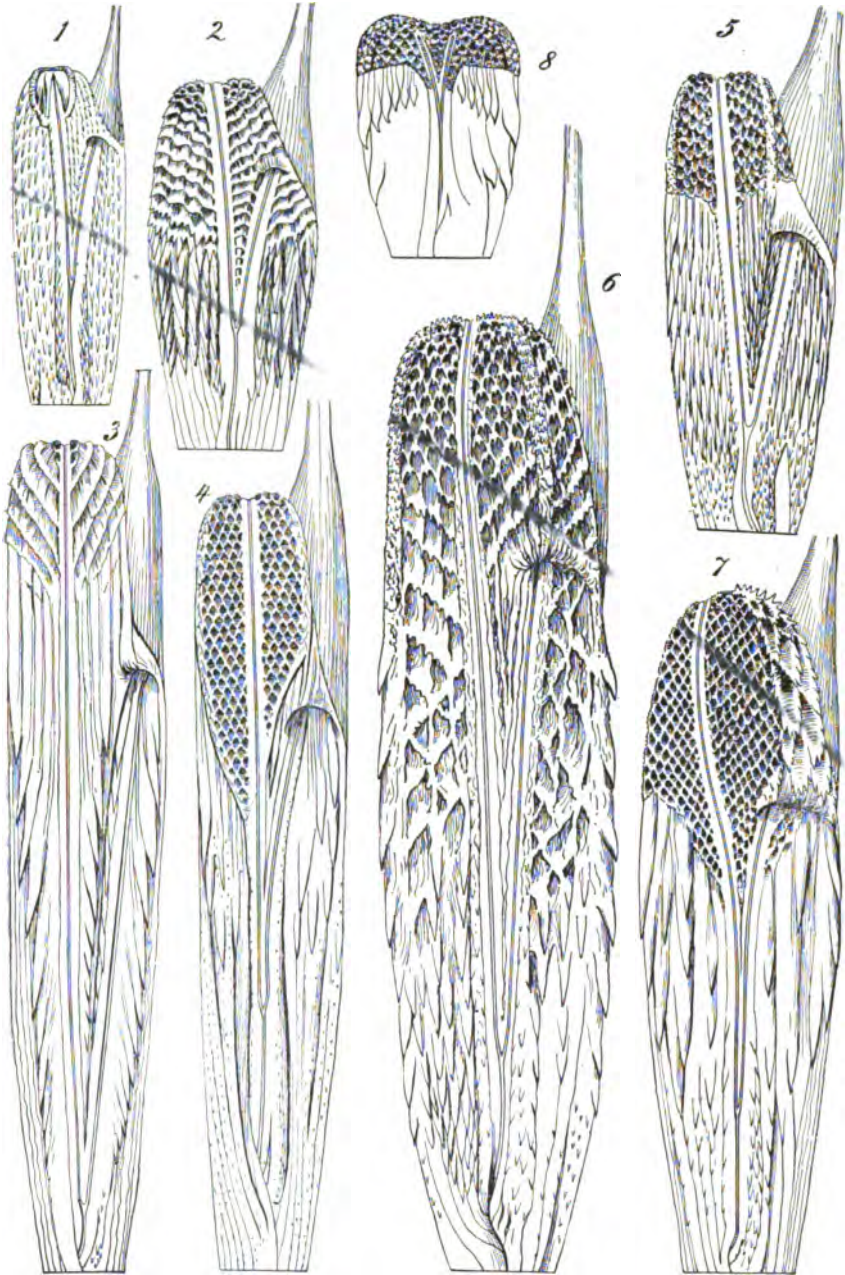
HEMIPENES OF XENODONTINÆ AND DROMICINÆ.

FOR EXPLANATION OF PLATE SEE PAGE 1241.



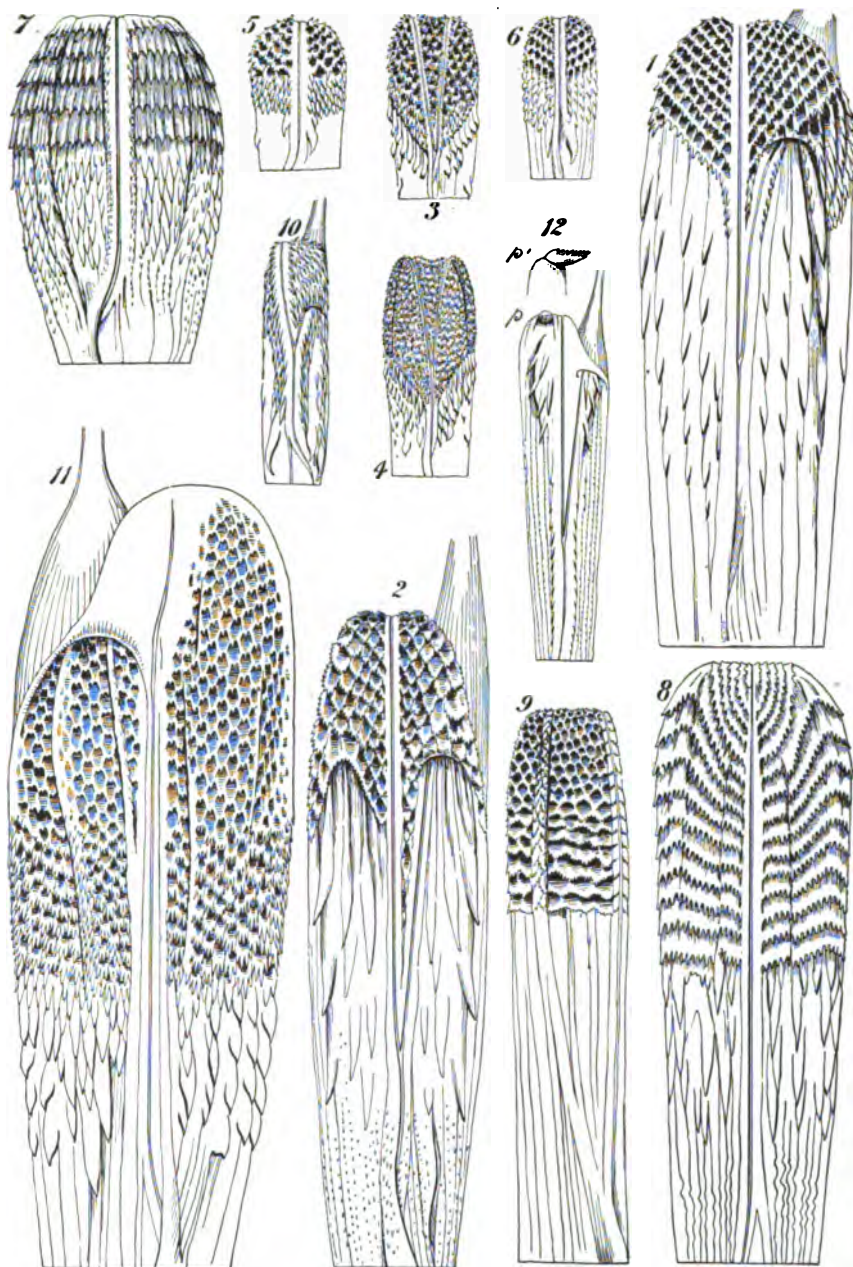
HEMIPENES OF XENODONTINÆ, DROMICINÆ, AND SCYTALINÆ.

FOR EXPLANATION OF PLATE SEE PAGES 1241, 1242.



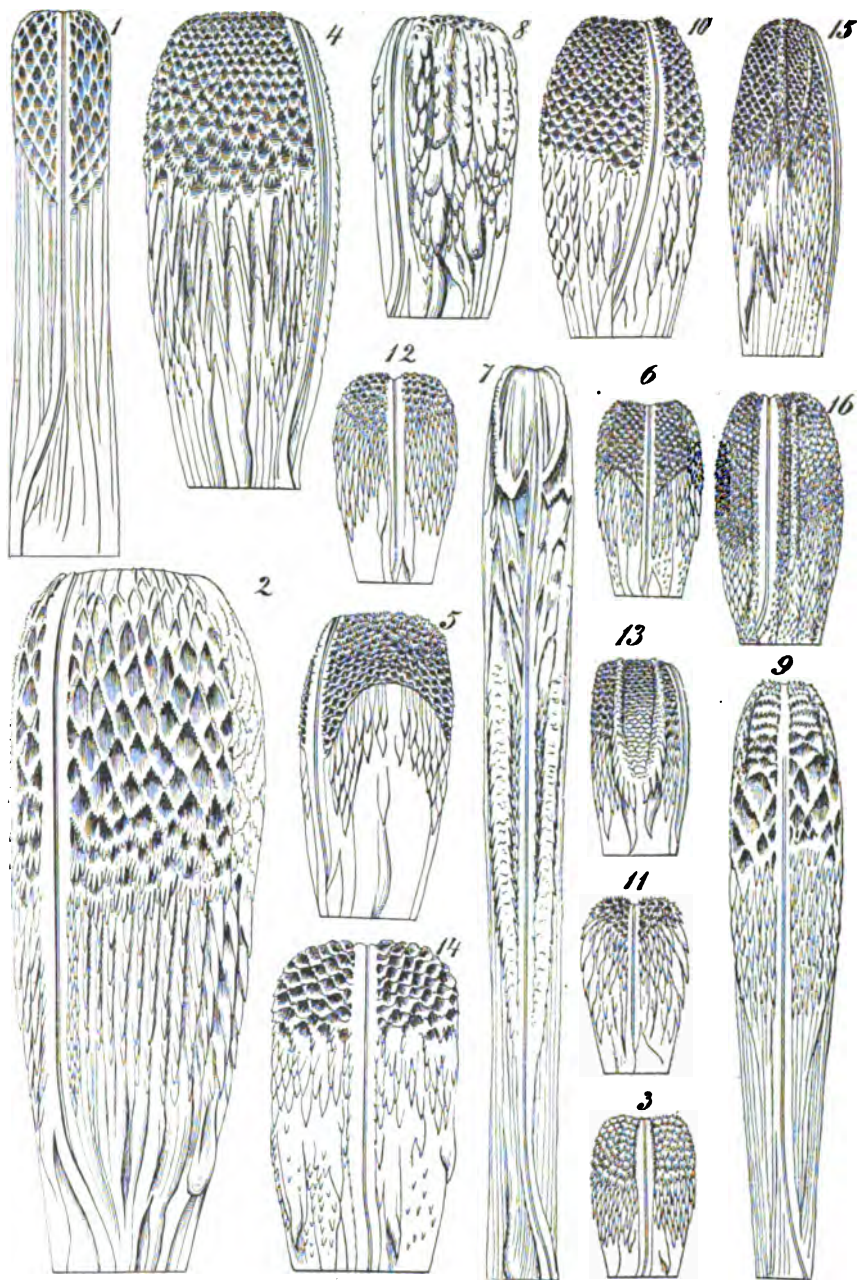
HEMIPENES OF ERYTHROLAMPRINÆ AND SCYTALINÆ.

FOR EXPLANATION OF PLATE SEE PAGE 1242.



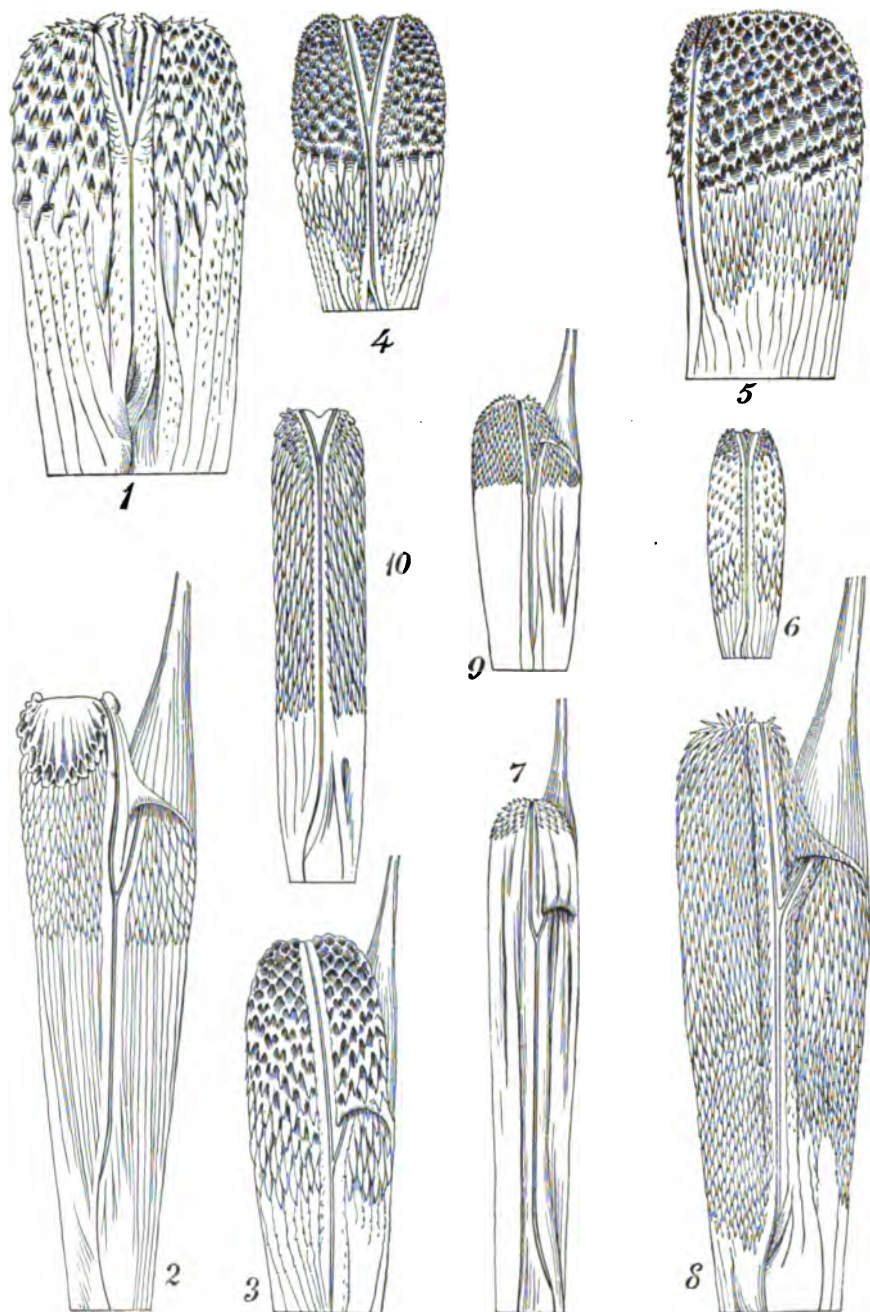
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FOR EXPLANATION OF PLATE SEE PAGE 1242.



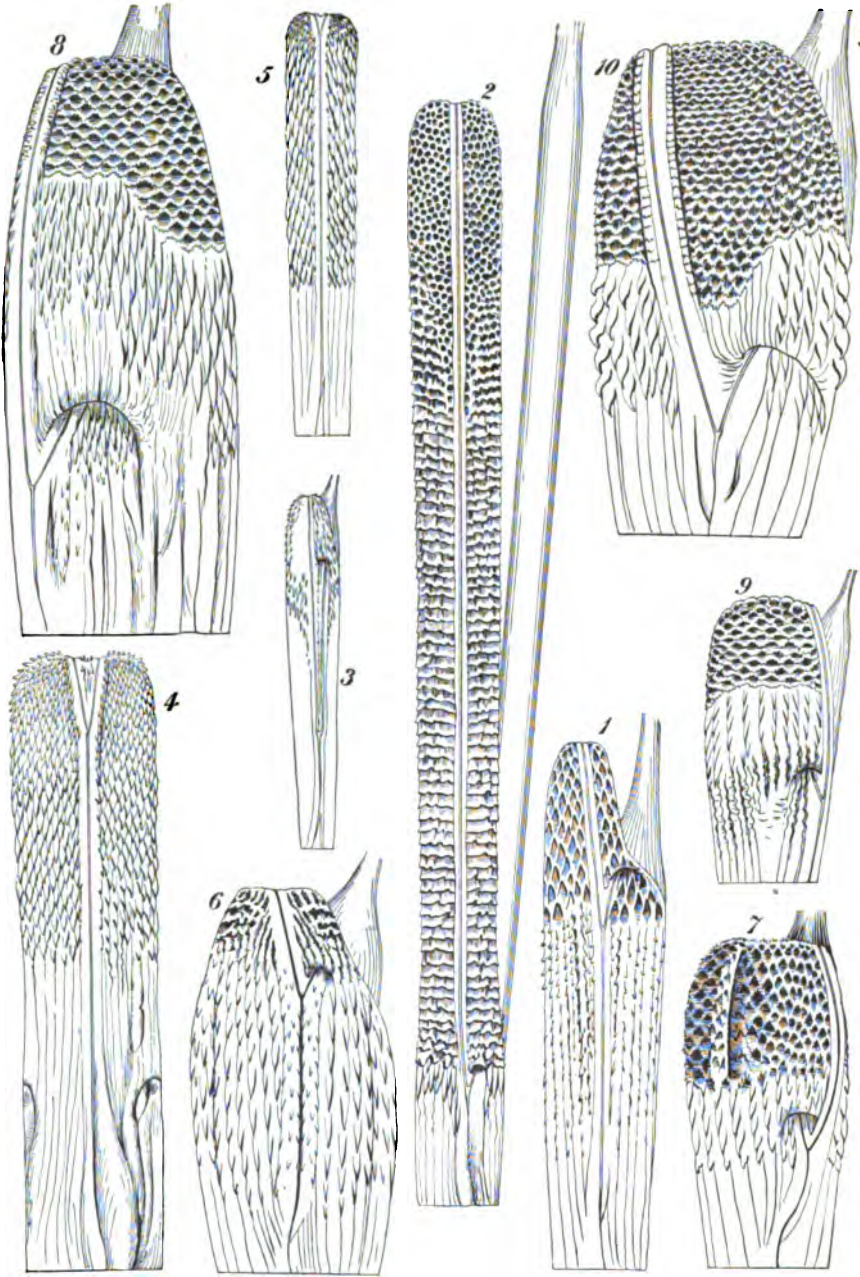
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FOR EXPLANATION OF PLATE SEE PAGES 1242, 1243.



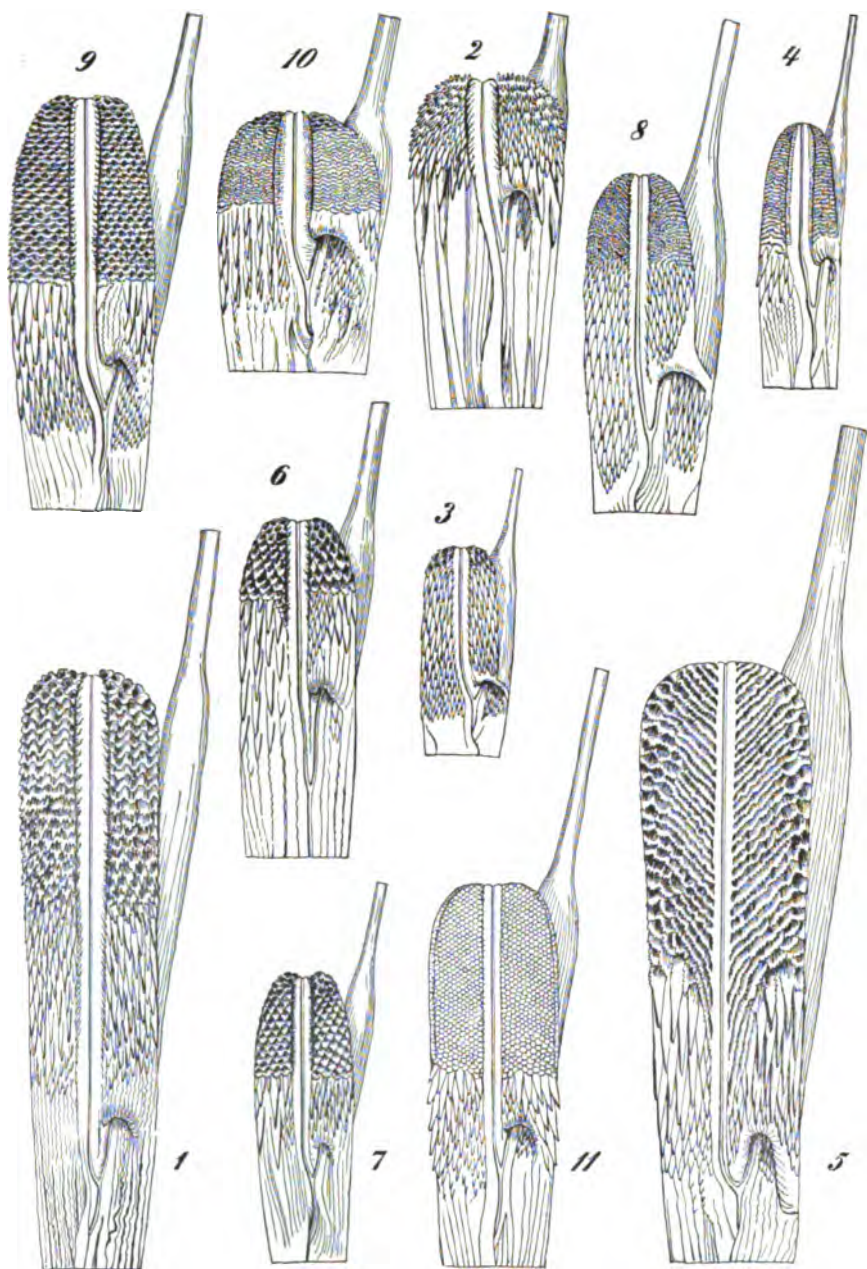
HEMIPENES OF PROTEROGLYPHA AND PLATYCERCA.

FOR EXPLANATION OF PLATE SEE PAGE 1243.



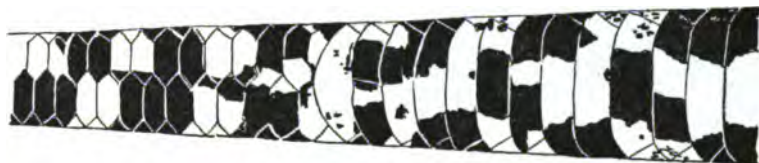
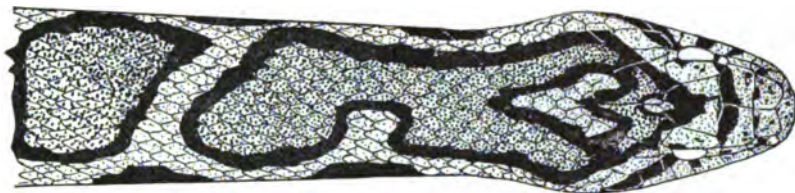
HEMIPENES OF PROTEROGLYPHA, PLATYCERCA, AND SOLENOGLYPHA.

FOR EXPLANATION OF PLATE SEE PAGE 1243.



HEMIPENES OF SOLENOGLYPHA.

FOR EXPLANATION OF PLATE SEE PAGE 1243.



1



2.

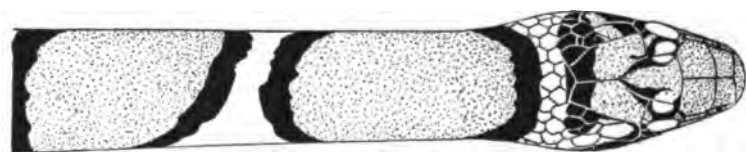
VARIATIONS IN MARKING ON SNAKES.

FIG. 1.—*Ophibolus doliatus triangulus*.

FIG. 2.—*Ophibolus doliatus clericus*.



3.

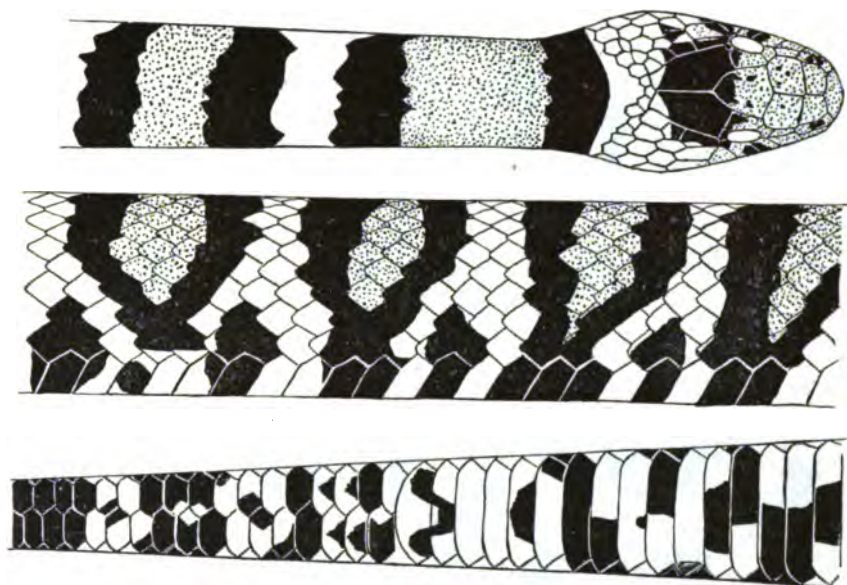


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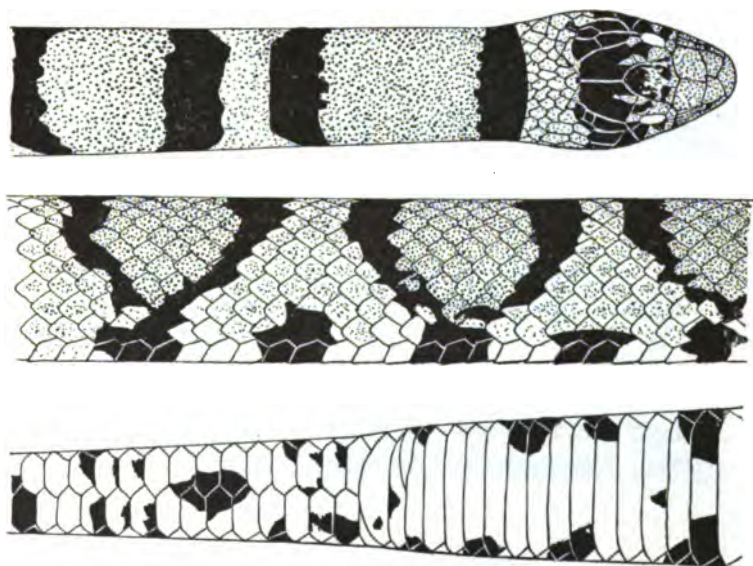
VARIATIONS IN MARKING ON SNAKES.

FIG. 3.—*Ophibolus doliatius collaris*.

FIG. 4.—*Ophibolus doliatius temporalis*.



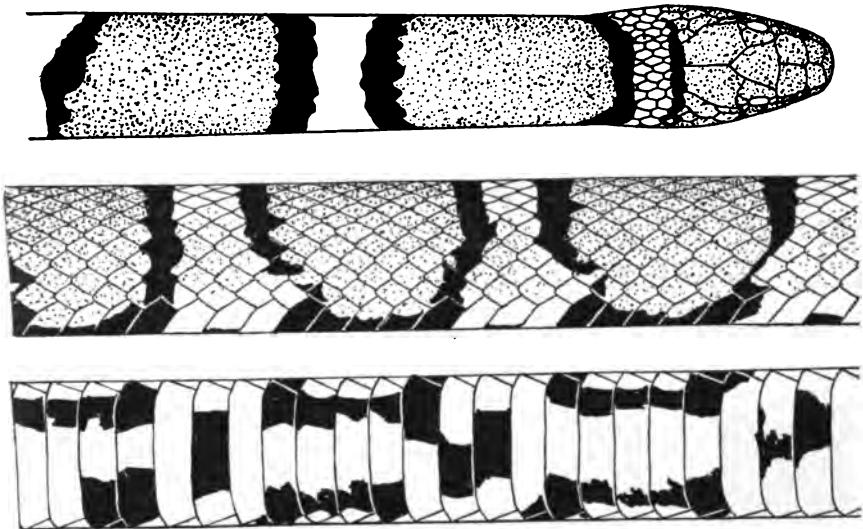
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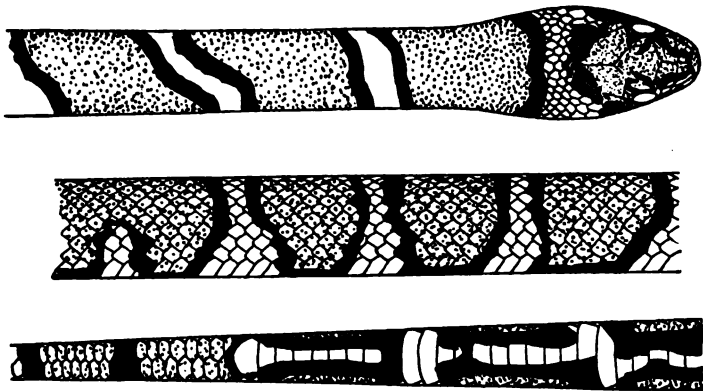
6.

VARIATIONS IN MARKING ON SNAKES.

FIGS. 5, 6.—*Ophibolus doliatatus doliatatus*.



7.

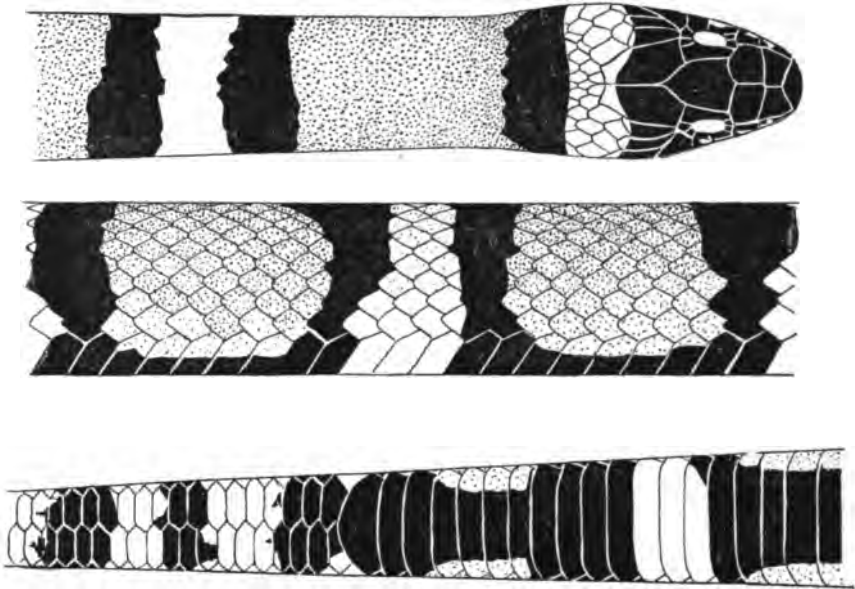


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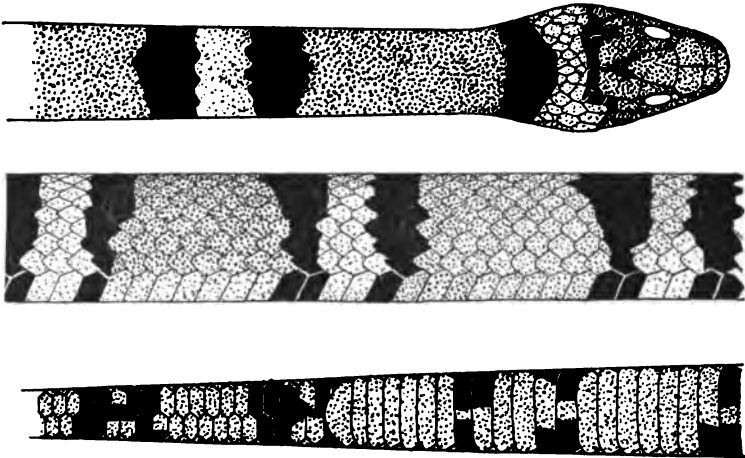
VARIATIONS IN MARKING ON SNAKES.

FIG. 7.—*Ophibolus doliatus eyepilus*.

FIG. 8.—*Ophibolus doliatus parallelus*.



9.



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VARIATIONS IN MARKING ON SNAKES.

FIG. 9.—*Ophibolus dollatus annulatus*.

FIG. 10.—*Ophibolus dollatus coccineus*.

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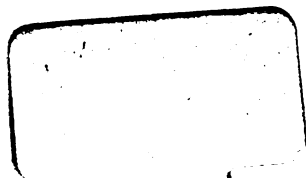
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